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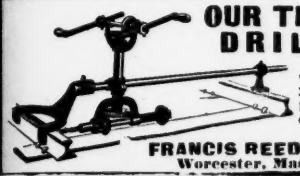
Vol. IV MAY, 1908 No. 5



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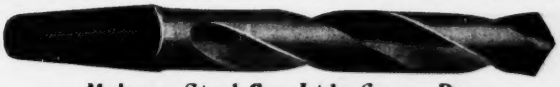
High  Grade

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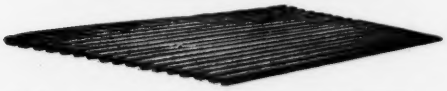

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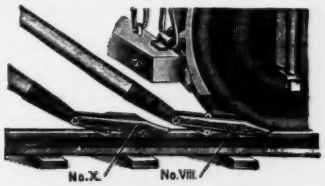

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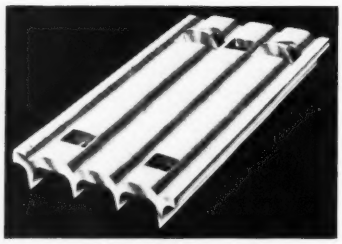

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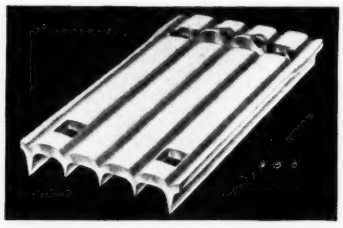

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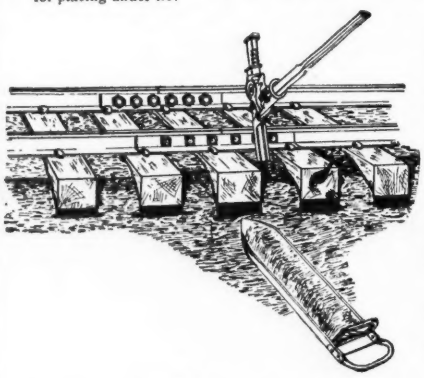
FIG. 1—Showing ballast removed from end of ties to be raised, track jacked up and device in position to receive ballast for placing under tie.



We will guarantee that every particle of ballast will remain under tie and that machine will work in any kind of ballast.

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FIG. 2—Showing pan removed, ballast under tie, and cleaner ready to be withdrawn.

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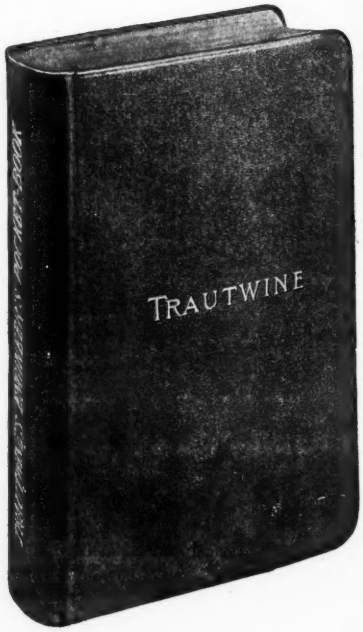

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CROPS FOR 1908

No one denies that the effects of the financial storm of 1907 are still noticeable, but at no time since last November has the promise of great improvement been better. We are approaching the time when the wheat crop can be safely estimated and conditions were never more favorable. It is generally believed that we will have another record-breaking yield of grain and produce and if so it spells prosperity for the railroads. It means that the rolling stock and equipment that has lain idle for six months will again be placed in commission, new cars and locomotives will be purchased and more men employed.

The Pennsylvania Railroad has issued 40 millions of bonds. The twenty millions apportioned to this country were over-subscribed seven times. The price of these bonds went to over par on the curb. The eagerness with which the public snapped up these bonds, indicates there is plenty of money and that it can be lured from its hiding places.

Other railroads have bonds to offer and when they are sold the money will be spent in building new lines and betterment. Much building and improvement, long contemplated, has been held back for months that will be begun soon now and carried on to completion. Throughout the west projected lines are showing activity.

For the work that is to be done, large amounts of money will be expended for equipment and track supplies. Officials are busy now making up their minds what tools, devices and systems they will adopt. It is the time of all times to reach them with your story—the why and wherefore of the superiority of your product. Tell them about it in Railway Engineering. It will pay you to do it now, better even than to wait until they are so busy that their time is limited. You can talk to them more effectively now and the orders will come later—try it—write for our proposition today.

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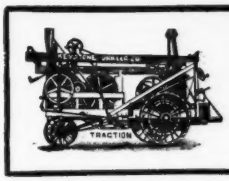

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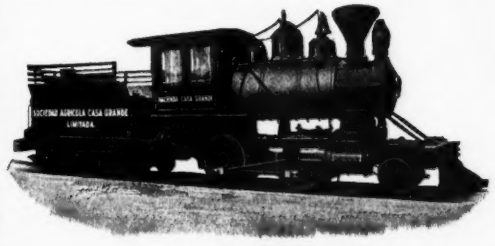

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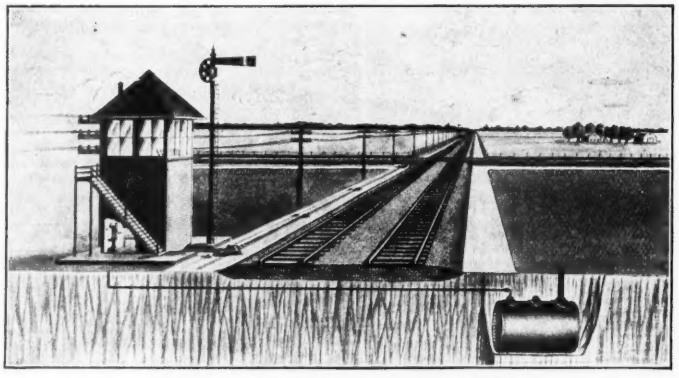

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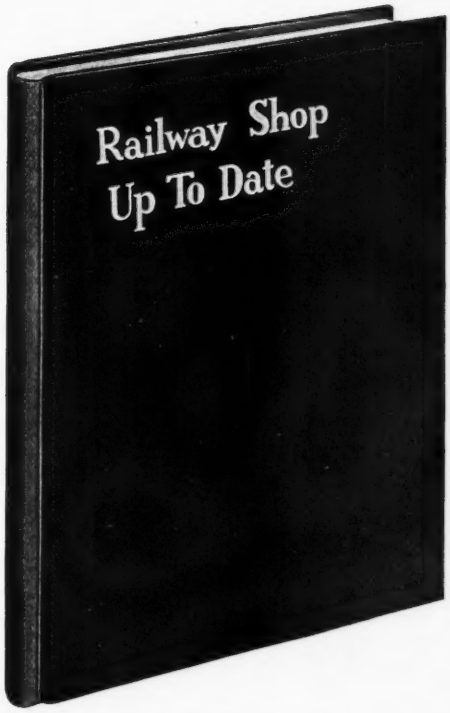

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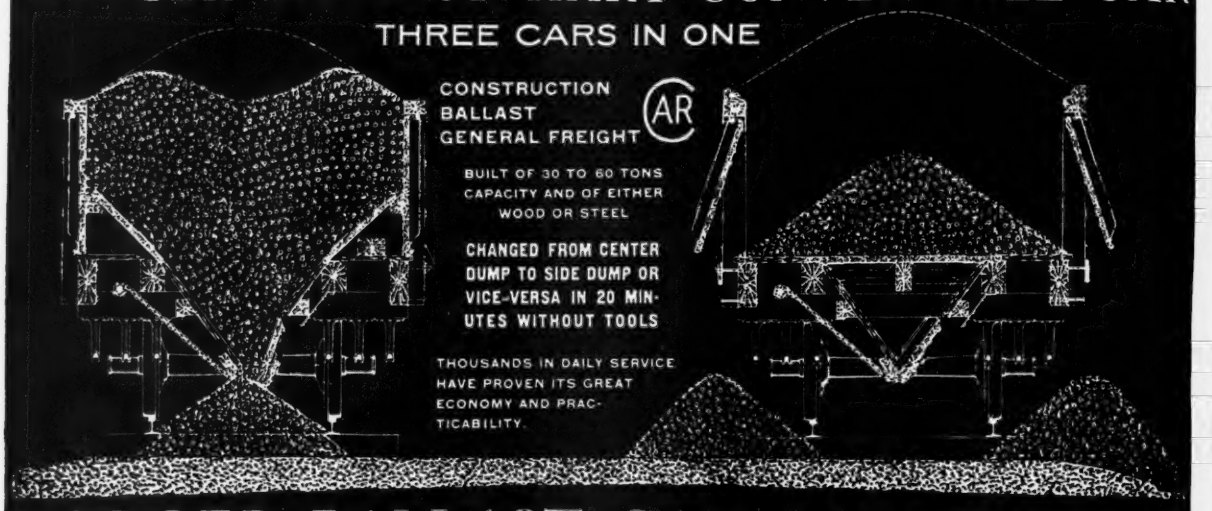
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The Value of a Property

IN ORDER to determine the true value of a property a thorough inspection must be made by an engineer familiar with the latest designs and improvements and capable of estimating its life.

In a paper by Mr. J. C. Kelsey, entitled, "The Relation Between the Banker and Engineer," of which an extract appears elsewhere in this issue, the proposition is brought out forcibly. He shows the necessity of the investigation by an engineer in a light that appeals to many. He refers more particularly to the security offered thereby to the banker and his clients and its elimination of frenzied finance, but in the valuation of a property for any purpose such an investigation is a proper proceeding.

Business Recovery

THE question of greatest importance to many in the commercial world today is the time when a radical change in the market will occur. The reaction from the financial stringency which had such depressing effects upon business is to come, but it will not affect all alike, mainly because of the varying state of preparedness which will exist among them.

If the turning point is thought to be next June or July, then it is necessary to prepare for it and to be in shape to put forth the best efforts. It is better to be a little in advance than to be behind, because delay in a case such as this is vital.

After a decision has been made to the best of one's ability regarding the time when a change will occur, plans should be laid and put into action before such time. The advance agent is the one that opens the way and after a slump is the one most liable to be forgotten.

In the railroad field there is, besides the new construction work, the constant repair work which calls for new materials and new appliances. Depreciation does not stop with a lull in business; it continues and sometimes on account of a lack of proper maintenance entails even greater expenditure in the end.

Experimental Investigation

IN AN investigation along new lines data are very often allowed to accumulate and a whole series of tests is made before anything is done in the way of checking up the data. When this is done a risk is taken that the data may not be in proper shape to eliminate doubt as to accuracy. This occurs so often that it seems best to occasionally call attention to the matter.

Before a series of tests is made, a complete analysis or outline of the proceedings is, of course, necessary but such does not guarantee the value of each set of tests. Where the data are deficient in any case, it is just so much time and labor wasted because there must be a doubt as to the accuracy.

Accuracy must be proved not only by presenting a clear outline of the method of obtaining data, thereby

assuring practical application, but also by the agreement of data taken. The variations in the data, which are used to arrive at certain conclusions, must be greatly in the minority to indicate that they are due to incorrect records which occur in all experimental investigations.

Assumptions in Designs

THE assumptions which must necessarily be made in the design of a bridge, building or other structure present a difficult problem to the young engineer, but if he is to succeed he must do all in his power to become capable of making the proper assumptions. First, he learns the theory and later the practice and upon these two his assumptions must depend. If he is deficient in one or the other, he can not be depended upon.

When theories were in crude shape and when there was little or no practice to go by, the engineer had to contend with greater problems. He could not apply the theories with any degree of certainly and for this reason had to allow greater factors of safety. Today, however, practice along many lines backs up the theory to such an extent that it is possible to make correct assumptions for any new design.

The engineer who does not know what has been done and who has not studied others' designs, is no better fitted than his predecessors. His case is different, however, for he has the opportunity of becoming better informed. His designs should be made, if possible, more economical and at less risk than the former. If he has not this knowledge of what has been done, he certainly is not fitted for a position of trust, which is the ambition of any consulting engineer.

Tie Plates

THE many designs of tie plates, shown elsewhere in this issue, evidence the difference of opinion which exists among engineers as to the form of plate that is most effective in securing the desired results. Besides the deviation in the form of plates, there is also a wide variation in the dimensions of plates for the same weight of rail. It may not be possible for engineers to agree upon the best design without extensive investigations, yet it should not be so difficult to arrive at more common conclusions in regard to the necessary dimensions.

The thickness of plates is shown to vary between ⅜ and ½ in.; the width to vary between 5 and 8 ins., and the length between 8 and 9 ins. These dimensions refer particularly to the tie plates for 85-lb. rail, including both flat and flanged plates. If the plate, 7 or 8 ins. in width, does not protect the tie better than the 6-in. plate and does not have any appreciable increase in life over the narrower plate, then the use of a 6-in. plate certainly represents economy. With regard to the length of plates the same proposition holds good, but concerning the thickness of plates the different designs will not allow of a recommendation for a standard thickness without limiting conditions.

Some plates are of the same thickness throughout, while others are heavier at the shoulder of the plate than at the ends. There are too many designs to refer to details, but as a general proposition it can be seen that in many designs there is no need for a continuation of the same thickness throughout the length of the plate.

Referring to the punching of plates many arrangements of spike holes are used. Plates are punched with two, three, four and five holes. Some can be used as right and left plates, some for two or more weights of rail and some for intermediate and joint plates. Probably the most important arrangement is the one for two weights of rail where a change in rail is contemplated. To some engineers the two-hole plate made in rights and lefts is preferable for ordinary conditions, because with this plate there are no open spike holes and water is not as accessible to the bottom of plate, there is no opportunity for the track man to put in more than the necessary number of spikes and the distance between spike holes can be maintained at approximately 3 ins., which is not possible in a 6-in. plate with three spike holes for right and left plates.

The design of tie plate, which is best adapted for use with the soft wood or treated tie, is being investigated by the Forest Service, U. S. Department of Agriculture. The conclusions, which will finally be given out, will be substantiated by tests and records. This investigation should affect more particularly the design of plate for use under different conditions and it is hoped that the conclusions will be so definite that the same assumptions will be made by the majority of engineers.

Screw Spikes

THE holding power of screw spikes has been shown to greatly exceed that of ordinary spikes in all tests that have been made. In a series of tests made at the University of Illinois Experiment Station by R. I. Webber, C. E., it was found that the efficiency of screw spikes to resist withdrawal is nearly twice as great as that of common spikes and that screw spikes are more efficient than ordinary spikes in resisting lateral displacement.

The screw spike has already been used extensively in Europe, which is indirectly due to the dense traffic and the timber supply. In this country it has not been necessary until recent years to give serious consideration to our timber supply, but today the question is agitated seriously and a full appreciation has dawned upon the engineer with the result that the treated tie is being used in place of the oak tie in greater numbers each year. Records of the Forest Service, U. S. Department of Agriculture, indicate how necessary it is to follow this plan. Now after the tie plate has been adopted by most roads for use more particularly with treated soft wood ties, it would seem that the screw spike would obtain greater consideration. The ordinary spike has to be redriven frequently and has a tendency to tear open the

tie and permit water to reach the interior of the tie, destroying the value of the antiseptic salts introduced into the tie. When this is done, the tie, of course, is subject to rapid decay and no longer has a life exceeding that of the ordinary soft wood tie, so it becomes an economic proposition to use the more costly screw spike.

Owing to the first cost of screw spikes and the extra cost of labor for driving them, engineers hesitate in adopting them. The cost of the spike will always be about double that of the ordinary spike, but the cost of boring the holes and driving the screw spikes has been decreased by the introduction of a machine for the purpose. With this machine three men are capable of turning out at least six times as much work as four men with hand auger and hand wrench each day. One road is already preparing to put in screw spikes on a 10-mile section.

The screw spike will certainly cut down the cost of maintenance and give better service than the ordinary spike. Its adoption is a step toward permanent track and for this reason it is probable that its use will be rapidly extended.

Standard Tie Plates

THE object of this article is to afford a comparison of the various designs of tie plates and to indicate the present practice of certain railroads. It was deemed best to illustrate the several methods of punching tie plates, the transverse and longitudinal sections of plates and the character of the flange on the bottom of the plate where sections would not suffice.

In Figure 1, the methods of punching intermediate plates are given. Diagrams Nos 1 and 2 indicate the punching of right and left hand plates with or without shoulders, while Nos. 3 and 3a show the punchings which permit of the use of a single plate for both sides of the track. Diagram No. 4 shows a plate for two different widths of rail bases. Diagrams Nos. 5 and 6 show four-hole plates which may be used as either rights or lefts, the only difference being that the spike holes in No. 6 are slightly staggered. Diagram No. 7 is for use with two widths of rail bases or two weights of rail. Diagrams Nos. 8 and 9 are right and left plates for two widths of rail bases and are not shoulder plates. Diagrams Nos. 10 and 11 have special punchings, illustrating plates now in use.

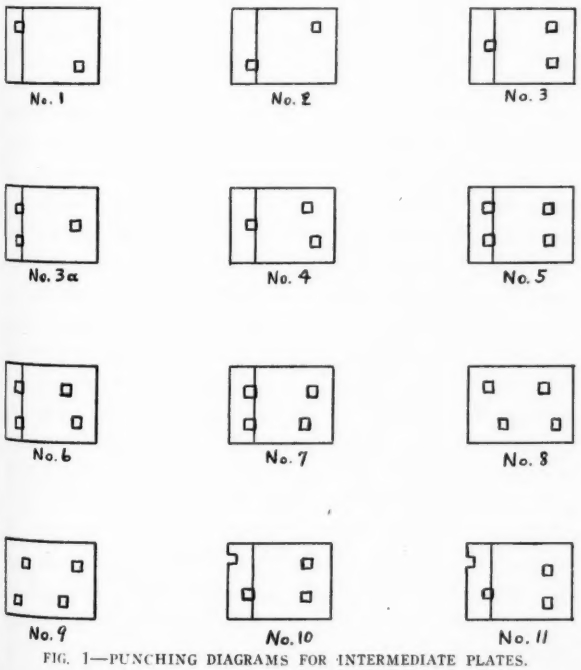


FIG. 1—PUNCHING DIAGRAMS FOR INTERMEDIATE PLATES.

In Figure 2, the methods of punching joint plates are shown. With the shoulder joint plate and spike hole inside of shoulder, the angle bar is usually slotted for the spikes and rests against the shoulder. With the low

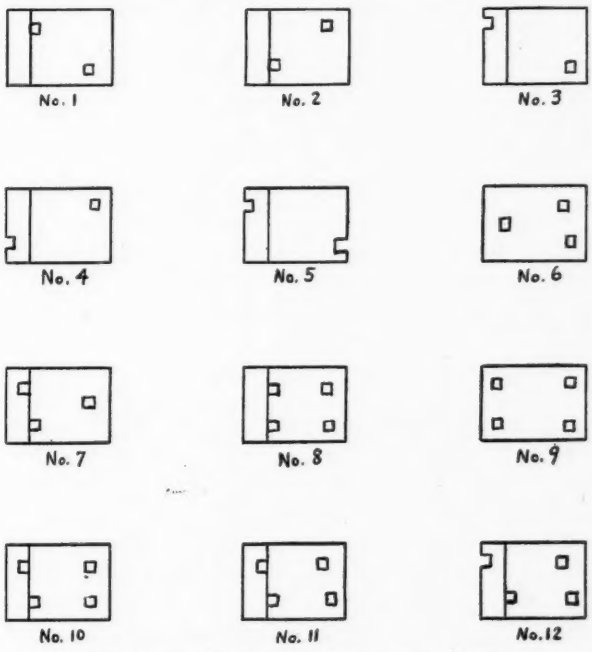


FIG. 2—PUNCHING DIAGRAMS FOR JOINT PLATES.

shoulder joint plate and spike hole at edge of plate, the base of rail may rest against the shoulder and the angle bar extend beyond the shoulder. Plates without shoulders are made both for angle bars with slotting and for angle bars without slotting, the distance between spike holes being increased over that for intermediate plates. Various methods of punching which embody the above principles are shown herewith. Joint plates are usually longer than intermediate plates and in some cases are wider.

In Figure 3, transverse sections of plates, taken parallel to the rails, are shown. The flat plate without shoulder, the flat plate with shoulder and flanged plates with or

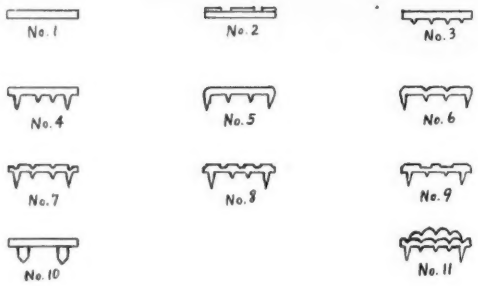


FIG. 3—TRANSVERSE SECTIONS OF PLATES.

without shoulders are indicated. Flanges of several depths and arranged in various ways are given. Corrugated upper surfaces are indicated with the exceptions of certain plates upon which the corrugations rise above the main body of the plate.

In Figure 4, longitudinal sections of plates, taken in the direction of the tie, are given: Flanges are shown which are placed across the tie and against the grain of the wood. One section shows a plate reinforced beneath the shoulder. Plates are also grooved near the center where it is not necessary to have the full thickness of metal to maintain strength. Other plates decrease in thickness from the shoulder to the inner end of plate and thus cant the rail.

In Figure 5, certain arrangements of flanges and corrugations are shown. Diagonal flanges or corrugations, as they are best termed on account of their small depth and arrangement, are shown on one plate, the corrugations being about ⅛-inch in depth. No. 2 shows more clearly the arrangement of flanges shown in No. 10, Figure 3, and No. 3, Figure 4.

In the following paragraphs, descriptions of standard tie plates are given, concluding with a table of dimensions.

CENTRAL RAILROAD OF NEW JERSEY.—The standard tie plates are 6x9x½ ins. with 5-16-in. shoulders. The punching diagram is shown by diagram, No. 11, Figure 1. The sections are similar to diagram No. 2, Figure 2, and diagram No. 8, Figure 4. The joint plates are 8x11 x½ ins. and the punching diagram for these plates is shown by diagram No. 12, Figure 2. The plates are made of wrought iron or low carbon rolled steel.

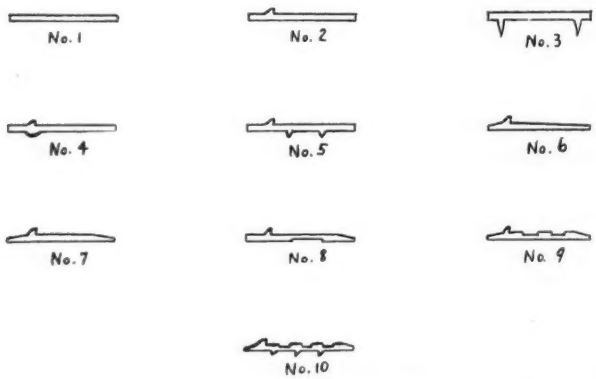


FIG. 4—LONGITUDINAL SECTIONS OF PLATES.

CHICAGO & NORTHWESTERN RAILWAY.—The standard tie plates for 80 and 90-lb. rail are 5x8½x⅜ ins. The transverse section of plate is shown by diagram No. 7, Figure 3. The punching diagrams are similar to diagrams No. 8 and 9, Figure 1. The distance between centers of spike holes is 2⅞ ins.

CHICAGO, BURLINGTON & QUINCY RAILROAD.—The standard tie plates are 6x8x7/16 ins., with ¼-in. shoulders. The punching diagrams for intermediate plates are similar to diagrams Nos. 1, 2 and 4, Figure 1, and for joint plates are similar to diagrams Nos. 4 and 5, Figure 2. The distance between spike holes is 2 ins. The bottom surface has ⅛-in. corrugations as shown in diagram No. 1, Figure 5. The longitudinal sections of the plates are similar to diagram No. 6 with the exception of the corrugations on the bottom surface.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.—The standard tie plates for 85-lb. rail are 5x8x9/32 ins. The shoulder is ¼ in. high and is placed only between the spike holes. The distance between centers of spike holes is 3½ ins. The punching diagram for intermediate plates is similar to diagram No. 5, Figure 1, and for joint plates is similar to No. 9, Figure 2. The joint plates do not have a shoulder and the distance between spike holes is increased 3/16 in. for end ties and 1 9/16 ins. for center ties. The flanges are ⅜ ins. wide and

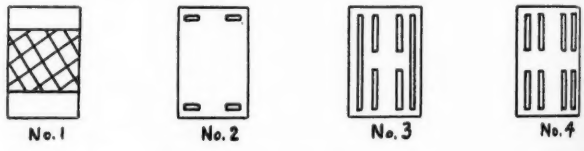


FIG. 5—BOTTOM VIEWS OF PLATES.

¾ in. deep, being located as shown in diagram No. 3, Figure 5. Diagram No. 2, Figure 4, shows a longitudinal section of plate without flanges. The plates are made of malleable iron.

DENVER & RIO GRANDE RAILROAD.—The standard tie plates for 85-lb. rail are 6x8x5/16 ins. with ½-in. shoulders and 7x8½x⅜ ins. with 5/16 in. shoulders. The punching diagrams are similar to diagrams Nos. 3 and 5, Figures 1. The distance between centers of spike holes for the 4-hole plate is 4⅜ ins. and for the 3-hole plate 3¾ ins. The first design of plate has a section, shown by diagram No. 11, Figure 3, and the second design has a section similar to diagram No. 7, Figure 4, with the exception of transverse corrugations on the top of plate. The punching diagram for joint plates is shown by diagram No. 8, Figure 2. The joint plates are about 1-in. longer than the intermediate plates.

GRAND RAPIDS & INDIANA RAILWAY.—The standard tie plates for 85-lb. rail are 5x8 ins. The punching diagrams are similar to diagrams Nos. 1, 2, 5 and 8, Figure 1.

GREAT NORTHERN RAILWAY.—The tie plates are made 6x8 ins., but vary in thickness from 5/16 to ½-in. The height of shoulder varies between ¼ and ⅜ ins. The punching diagrams are similar to diagrams Nos. 2, 3

TIE PLATE DIMENSIONS.

Railroad	Weight of Rail	Thickness of Plate	Width of Plate	Length of Plate	Height of Shoulder
C. R. R. of N. J....	90	1/2	6	9	5/16
C. & N.-W.....	90	3/8	5	8½	
C., B. & Q.....	85	7/16	6	8	1/4
C., M. & St. P....	75	9/32	5	7½	1/4
D. & R. I.....	85	3/8	7	8½	5/16
G. R. & I.....			5	8	
G. N.		5/16	6	8	1/4
Har. Lines	90	7/16	8	8¾	1/4
Ill. Cent.	85	3/8	5½	8	1/4
Inter-Col.	80	7/16	5	8	
L. V.	90	3/8	5	8	
Mich. Cent. 100		3/8	5	9	1/4
Mo. Pac.	85	1/2	6½	8¾	1/4
P. L. W. of P.....		1/2	7	8¼	7/16
Phila. & Read.....	90	1/2	6	9	5/16

and 5, Figure 1. The distance between centers of spike holes is 3 ins. One design of plate has a section similar to diagram No. 8, Figure 3, with short flanges ⅜ in. deep and long flanges 15/16 in. deep; a second design of plate has flanges 7/16x2 ins., ⅝ in. deep, similar to diagram No. 4, Figure 5; a third design has a section similar to diagram No. 2, Figure 4, and a fourth design has flanges 5/16x1 in., 1¼ ins. deep, similar to diagram No. 2, Figure 5. Plates of rolled steel and malleable iron are used.

HARRIMAN LINES.—The standard tie plates for 90-lb. rail are 8x8¾x7/16 ins. The shoulder is ¼ in. high. The punching diagram is similar to diagram No. 6, Figure 1. Sections of the plate are given by diagram No. 1, Figure 3, and diagram No. 9, Figure 2. The distance between centers of spike holes is 3 ins.

ILLINOIS CENTRAL RAILROAD.—The standard tie plates for 85-lb. rail are 5½x8x⅜ ins. with ¼-in. shoulders. The distance between spike holes is 3½ ins. The punching diagram for intermediate plates is similar to diagram No. 3, Figure 1. The longitudinal section is similar to diagram No. 7, Figure 4. The punching diagram for joint plates is similar to diagram No. 6, Figure 2, the length of the plates being 9 ins.

INTERCOLONIAL RAILWAY.—The intermediate steel tie plates for 80-lb. rail are 5x8x7/16 ins. The distance between centers of spike holes is 2¼ ins. The punching diagrams are similar to diagrams Nos. 1 and 2, Figure 1. The longitudinal section of the plate is shown by diagram No. 10, Figure 4.

LEHIGH VALLEY RAILROAD.—The standard tie plates for 90-lb. rail are 5x8x⅜ ins. and 5x8½x5/16 ins. The first design of plate has four flanges as indicated by diagram No. 2, Figure 5, and the second design has a transverse section similar to diagram No. 8, Figure 3. The intermediate and joint plates are punched similar to diagrams, Nos. 1 and 2, Figure 1. The first design is a shoulder plate and the distance between centers of spike holes is 2 ins. for intermediate and 4 ins. for joint plates, the width of joint plate being 6⅜ ins. In the second design the distance between centers of spike holes is 2¾ ins. for intermediate plates and 4 ins. for joint plates, the width of joint plate being 6 ins.

MICHIGAN CENTRAL RAILROAD.—The standard tie plates for 100-lb. rail are 5x9x⅜ ins., and for 60 to 80-lb. rail are 5x8x⅜ ins. The shoulder is ¼ in. high. There are four flanges as indicated by diagram No. 4, Figure 1, the inner flanges being 5/16 in. deep and the outer flanges being ½ in. deep. The punching diagram for tie plates for 100-lb. rail is similar to diagram No. 5, Figure 1. The plates for 60, 65 and 80-lb. rail are punched with 5 spike holes, so that the one plate serves as a right and left hand plate for the 60-lb. rail, either a right or left for the 65-lb. rail and a left or right for 80-lb. rail.

MISSOURI PACIFIC RAILWAY.—The standard tie plates for 75 and 85-lb. rail are made 6½x8¾x½ ins. and 6x8x½ ins. with ¼-in. shoulders. The punching diagrams are similar to diagram No. 7, Figure 1. The bottom surface of the smaller plate is corrugated as shown by diagram No. 1, Figure 5, and the transverse and longitudinal sections of the plates are similar to diagrams, No. 2, Figure 3, and No. 7, Figure 4, with the exception of the ⅛ in. flanges on the bottom surface. The large plate has ⅛-in. flanges similar to diagram No. 3, Figure 3.

PENNSYLVANIA LINES WEST OF PITTSBURGH.—The standard tie plates of 85-lb. rail are 7x8¼x½ ins. and for 100-lb. rail are 7x9x⅝ ins. The shoulder on these plates is 7/16 in. high. The plates are punched similar to diagram No. 10, Figure 1, and have four ⅛x1 in. flanges, 1¼ ins. deep, as indicated by diagram No. 10, Figure 3; diagram No. 3, Figure 4, and diagram No. 2, Figure 5. Diagram No. 7, Figure 4, shows a longitudinal section of plate without flanges. The distance between centers of spike holes is 3 ins.

PHILADELPHIA & READING RAILWAY.—The standard tie plates are of the same design as those for the Central Railroad of New Jersew, described above.

The accompanying table shows certain dimensions in which there is considerable variation for the standard tie plates of the several railroads.

Cost of Watching the Railroads

A communication from the Interstate Commerce Commission transmitted to the house of representatives this week states that it will cost the United States government $750,000 a year for the supervision of railroad accounts under the present Interstate Commerce act. The document contains a letter from Commissioner Harlan, in which he says that it will require a board of examiners, composed of 285 men, especially trained in the methods of railway accounting, to supervise the accounts and practices of the steam railroads. This estimate does not cover such examiners as may be required later to supervise the accounting methods of express companies, water lines and pipe lines.

The superintendents of the Lehigh Valley have had made 197 surprise tests of enginemen, and report perfect records in all cases; no engineman was caught napping. It is a rule on the Lehigh Valley that at least three officials shall take part in every test, and they sign a report giving full details.

Preservatives for Iron and Steel

THE question of the best preservative for iron and steel is one on which there is a wide difference of opinion, though there are a number which are generally classed as good. The preservation of the metal depends not only upon the preservative covering but also upon the thoroughness with which the metal has been cleaned and the method of applying the preservative. It is not intended to discuss the question at this time, but to refer to certain preservatives which have been used in England.

COMPOSITION OF PORTLAND CEMENT.

In the discussion of a paper presented by Mr. Bertram Blount before the Institution of Civil Engineers, Mr. R. Elliott-Cooper spoke of certain preservatives which he had used. An extract of his discussion is as follows:

"In this country, we are very much inclined to stick to the ordinary trade paints, but in other countries, those trade paints are not altogether satisfactory, and at present, in Cape Colony, I am experimenting with a composition of Portland cement and oil. The Portland cement is mixed with sufficient oil to make a thick paste, and I am trying that on some of the large bridges I have built in Cape Colony. There is the remarkable effect of the intense heat of the sun's rays upon these structures to be considered. However good the paint, and however well applied, there appears to be a process going on by which the paint not only seems to get thinner, but actually peels off. Then I am also trying, alongside, so to speak of this preparation of Portland cement, a paint known as Ferrodore, which I have used in England, and which is a very excellent paint, in my opinion. I first saw it in Berlin, where it was used on the bridges over the River Spree. The natural color of the paint is a silver gray. In its early days I saw the actual process of manufacture, and I believe the color of silver grey is the best for general purposes; at any rate, I found it suitable in this country, and I am now trying it in Cape Colony. I believe it is used to a very large extent further north on the Rhodesian railways. Perhaps Mr. Fox may be able to say something about that, because it is a matter of considerable importance, in countries where skilled labor is very dear, that some paint or composition should be found which is practically useful. Mr. Blount recommends that tar should be used. This, of course, we have all used, particularly on the under sides of bridges, and probably it is one of the best preservatives, but a bridge so coated on the outside girders, would undoubtedly look somewhat unsightly. For the under work, there is no better or cheaper material than a tar composition."

RAIL CORROSION AND WEAR.

On the subject of rail corrosion and wear, Mr. J. M. Moncrieff made the following remarks:

"On the question of rusting of rails, we are rather apt to attach too little importance to the rusting. Some years ago, on the Lancashire & Yorkshire Railway, I obtained some accurate records of the loss of weight by rusting as compared with the loss of weight by wear, and I found over a large number of samples very different rates of wear and very different rates of rusting, but on the average, the rail lost about 35 per cent of its total loss by corrosion, leaving only 65 per cent to be lost by wear. There were many cases, of course, where the loss by corrosion was much more than that. In one case in the open air in the heart of Manchester, it was as high as 57 per cent as compared with only 43 per cent of wear. In town atmospheres, rails lose weight to a very great extent by corrosion, much more perhaps than we have been in the habit of thinking. The question whether in sulphurous town atmospheres it would not be worth while protecting the rails might be quite worth consideration."

GRAPHITE.

Mr. G. W. Wollaston referred to graphite as a pigment for protecting iron structures as follows:

"Graphite has been used as a pigment for more than forty-five years, and with increasing success in the United States. It has been used in Great Britain for some five or six years, and I believe it is increasing in favor and think some of the members present have had good results with it. It has advantages as a protective paint, in the fact that graphite itself has a great affinity for metal. It is inert and is not affected by chemicals. Its well-known lubricating qualities are also an advantage, as it works under the brush easily and the labor in applying it is far less than with heavy paint. I am not proposing to go into a detailed account regarding graphite as a pigment, but will be pleased to reply to any questions."

Automatic Stops and Cab Signals

The Railway Signal Association, in assigning work for 1908, has appointed a committee consisting of Messrs. W. H. Elliott, N. Y. C. & H. R. R. R., (chairman); A. R. Raymer, P. & L. E. R. R., vice-chairman; E. M. Weaver, Long Island R. R.; G. D. Fowle, Pennsylvania R. R.; J. V. Young, B. & M. R. R.; C. H. MacDougald, Tidewater Ry.; W. E. Bullard, N. Y., N. H. & H. R. R.; W. McC. Grafton, Pennsylvania Lines, West; H. J. Foale, Wabash R. R.; D. M. Case, C. N. O. & T. P. Ry.; E. E. Mack, C. & E. I. R. R.; Wm. Hiles, Big Four Ry.; A. C. Holden, Great Northern Ry.; J. R. Decker, Michigan Central R. R.; G. W. Hulsizer, Southern Ry.; G. H. Dryden, B & O. R. R.; E. C. Graham, B. & A. R. R.; and J. A. Beoddy, N. & W. Ry., to report on automatic stops and cab signals. The committee have been instructed to report especially on, (1) Various cab signals and automatic stops which are worthy of recommendations; (2) proper location of automatic stop trips for varied conditions of traffic; (3) advisability of the use of cab signals as a substitute for fixed signals or adjuncts thereto. In order that the committee may become informed regarding the latest state of the art and obtain the advice and assistance of those interested, inventors and manufacturers of devices of the kind referred to are requested to communicate with the chairman either in person or by letter, and furnish full description, patent specifications if possible, and drawings showing their devices.

Length of Split Switches

REGARDING the use of 16½-ft. in place of 15-ft. split switches, statements of several manufacturers are here given:

STATEMENT NO. 1.

We think that this is a matter that should be determined largely by the engineering department of the different railway companies upon the basis of using whichever length of switch is found to be more advantageous. We think that the angle of the frog should be taken into consideration by them, and also how they desire to cut the rails connecting the switch with the frog.

From our standpoint as manufacturers we prefer to build 16½-ft. switches for the reason that the majority of heavy rails now rolled by the rail companies are 33 ft. long instead of 30 ft. as was the practice several years ago. You will see in this way there will be absolutely no loss of rail entailed in making the 16½-ft. switches, whereas if we should cut a 15-ft. switch from a 33-ft. rail there would be a drop of 3 ft., which would be impossible to use in any other switch work and difficult to use in frog or crossing work. Aside from this fact, the manufacturers of course receive more money for a 16½-ft. switch than they do for a 15-ft. switch.

STATEMENT NO. 2.

It is true that practically all our customers use switches 15 ft. long as standard. I think it is also true that a longer switch would give better service. The 15-ft. length was adopted because it enabled them to get a switch out of a 30-ft. rail, which was then standard. As 33-ft. rails are now standard, 16½ ft. would be a practical length; and the 16½-ft. switch for 80-lb. rail would enable them to get about the same switch angle that they got with a 15-ft. switch for 70-lb. rail.

So far as the manufacturer is concerned, if there is a difference it would be in favor of the 16½-ft. switch, although we can nearly always get rails 30 ft. long when the mill is rolling. Notwithstanding the fact that the longer switch gives a better riding track, the fact that it costs a little more money seems to be the barrier. Switches should have slide plates on every tie. This would require two additional plates and the little additional length to the rail, and this seems to be a barrier. The other one is that the 15-ft. switch is everywhere in service, and to put in the longer switch to replace the shorter one requires a change of lead or moving the head blocks. It breaks up the interchangeability which is an important factor in railroad economy, but we believe should not prevent progress.

STATEMENT NO. 3.

We find that a few of the roads are specifying a length of 16½ ft. for main line switches, but for yards are still holding to 15-ft. lengths, which is still standard for both main line and yard with the majority of roads to the best of our knowledge.

From the manufacturer's standpoint, the advantage in making switch points 16½ ft. is that these cut without waste from 33-ft. rails, which is now the standard length for rails from 70 lbs. per yard up.

Engineers on Conservation

A MEETING was held on April 14 in the auditorium of the Engineering Societies building, under the auspices of the American Society of Mechanical Engineers, in response to the invitation of President Roosevelt to engineers to co-operate for securing the conservation of our national resources. A letter was read from the President expressing gratification at the zeal with which engineers had taken up this problem.

The meeting was presided over by J. W. Lieb, Jr., vice-president of the Society, who called attention to the fact that the first president of the United States was an engineer, who was interested in the development of water ways. Dr. W. J. McGee, chief of the Bureau of Soils, Washington, D. C., followed with an address on the Conservation of the Water and Woods, calling this the most important subject now before the people. The country began with a revolution in which there was war; but it is now time for a great revolution without war in which there shall be an awakening of a moral sense of obligation for the preservation of natural resources. One of the losses confronting the people of the United States is the loss of ground water. Too much flows away in torrent, because of the destruction of the forests. Instead of acting like a sponge the earth when stripped of its timber sheds water like the roof of a building. The fertile soil washed away in the United States represents an annual loss of over $1,000,000,000.

Dr. W. F. M. Goss, dean of the College of Engineering, University of Illinois, spoke upon the Conservation of the Nation's Fuel Supply, saying that economy in its production and use is to be enforced by a four-fold process. The necessary steps are: Scientific research for the establishment of facts; practical demonstrations of facts thus developed on a scale which will convince men that there is profit, direct or indirect, in a better practice; restrictive legislation which will protect the public from the competition of unscrupulous men; and finally effective inspection which will secure an enforcement of law. The process cannot successfully begin with coercion; it must begin with education.

Prof. George F. Swain, of the Massachusetts Institute of Technology, Boston, presented the subject of Stream Flow, Water Power and Navigation. The most effective way of regulating stream flow is by preservation of the forests, and this produces three effects of great importance. It conserves one of our greatest natural resources —water power; it prevents erosion of the soil; and it prevents the silting of navigable rivers and harbors as well as of reservoirs.

The concluding address, by Dr. Henry S. Pritchett, president of the Carnegie Foundation, treated of the attitude of the engineer towards the public. Engineering has grown into a profession that must consider public inter-

ests. The practical demonstration of professional ideals lies in the use of fair judgment, a sound sense of justice and quick appreciation of the larger public causes. The engineer not only plans, but carries out great enterprises. If he be a true member of his profession, he will, while serving loyally his employer keep in mind the honor of his profession, the debt he owes to it and the service to the larger interests of humanity.

Steel Rail Specifications

THE new steel rail specifications adopted by the Pennsylania Railroad were drafted by a special committee of the company's officials, made up of the following engineers: Theo. N. Ely, chairman; A. C. Shand, L. R. Zollinger, A. W. Gibbs, C. B. Dudley, T. H. Johnson, Robt. Trimble, W. C. Cushing, J. C. Bland, and D. F. Crawford.

DIMENSIONS OF 85-LB. RAIL.

Prepared by Committee on Steel Rails.

Area of Head 3.57 sq. ins.	42.2%
Area of Web 1.51 sq. ins.	17.8
Area of Base 3.39 sq. ins.	40.0
Total .....8.47 sq ins.	100.0%
Moment of Inertia	29.1
Section Modulus ....Head	10.77
Section Modulus ....Base	12.02
Ratio Periphery Head to Area....Head	1.73
Ratio Periphery Web to Area....Web	3.81
Ratio Periphery Base to Area....Base	2.69
Ratio Total Periphery to Total Area	2.48

DIMENSIONS OF 100-LB. RAIL.

Prepared by Committee on Steel Rails.

Area of Head 4.09 sq. ins.	41.0%
Area of Web 1.85 sq. ins.	18.8
Area of Base 4.03 sq. ins.	40.4
Total .....9.97 sq ins.	100.0%
Moment of Inertia	41.9
Section Molulus ....Head	13.71
Section Modulus ....Base	15.91
Ratio Periphery Web to Area....Web	3.58
Ratio Periphery Head to Area....Head	1.59
Ratio Periphery Base to Area....Base	2.43
Ratio Total Periphery to Total Area	2.30

CHEMICAL COMPOSITION.

1. The steel of which the rails are rolled shall conform to the following limits in chemical composition:

	Lower limit. %	Desired composition. %	Upper limit. %
Carbon	0.45	0.50	0.55
Manganese	0.80	1.00	1.20
Silicon	0.05	0.12	0.20
Phosphorus	....	....	0.10
Open hearth steel rails—			
Carbon	0.70	0.75	0.80
Silicon	0.05	0.12	0.20
Manganese	....	....	0.80
Phosphorus	....	....	0.03

PROCESS OF MANUFACTURE.

2. Ingots shall be kept in a vertical position until ready to be rolled, or until the metal in the interior has had time to solidify.

3. No "bled" ingots shall be used.

("Bled ingot"—One from the center of which the liquid steel has been permitted to escape.)

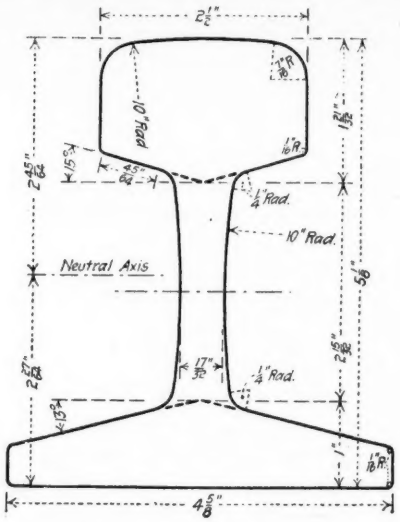
4. There shall be sheared from the end of the bloom formed from the top of the ingot sufficient discard to insure sound rails.

(All metal from the top of the ingot, whether cut from bloom or rail, is the top discard.)

5. In reheating, care shall be taken to avoid burning the steel, and under no circumstances shall a "cinder heat" be used.

("Cinder heat"—One in which the scale on the sides of the ingot becomes fluid.)

6. The number of passes and speed of train shall be so regulated that on leaving the rolls at the final pass the temperature of the rail will not exceed that which requires a shrinkage allowance at the hot saws, for a rail 33 ft. in length, of 6¼ ins. for 85-lb. section, and 6½ ins. for 100-lb. section. These allowances to be decreased at the rate of 1/100-in. for each second of time elapsed between the rail leaving the finishing rolls and being sawed. The bars shall not be held for the purpose of reducing their temperature, nor shall any artificial means of cooling them be used between the leading and finishing passes, nor after they leave the finishing pass.

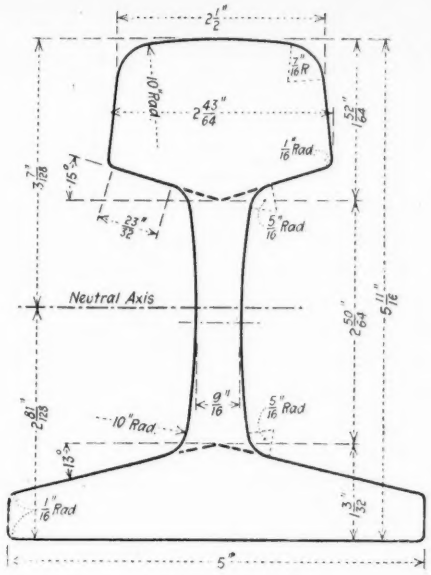


EIGHTY-FIVE POUND RAIL.

MECHANICAL REQUIREMENTS.

7. The name of the maker, the weight and type of the rail, and the month and year of manufacture shall be rolled in raised letters and figures on the side of the web, and the number of the heat shall be plainly stamped on each rail where it will not subsequently be covered by the splice bars. A letter shall be stamped on the web to indicate the portion of the ingot from which the rail was rolled.

8. The section of rail shall conform as accurately as possible to the templet furnished by the railroad company. A variation in height of 1/64-in. less or 1/32-in.



ONE-HUNDRED POUND RAIL.

greater than the specified height, and 1/16-in. in width of flange, will be permitted; but no variations shall be allowed in the dimensions affecting the fit of the splice bars.

9. The weight of the rails specified in the order shall be maintained as nearly as possible, after complying with the preceding paragraph. A variation of ½ of 1% from the calculated weight of section, as applied to an entire order, will be allowed.

10. The standard length of rails, at a temperature of 60° F., shall be 33 ft. Ten per cent of the entire order will be accepted in shorter lengths, varying as follows: 30 ft., 27½ ft., and 25 ft.; and all No. 1 rails less than 33 ft. long shall be painted green on ends. A variation of ¼-in. in length from that specified will be allowed.

11. The rails must be free from injurious mechanical defects and flaws; shall be sawed square at the ends, a variation of not more than 1/32-in. being allowed; and burrs shall be carefully removed.

12. The rails shall be smooth in the heads, straight in line and surface, and without any twists, waves or kinks, particular attention being given to having the ends without kinks or drop.

The hot straightening shall be carefully done, so that gagging under the cold presses will be reduced to a minimum. Any rail coming to the straightening presses showing any sharp kinks or greater camber than that indicated by a middle ordinate of 4 ins. in 33 ft. will be at once marked as a No. 2 rail, and only accepted as such. The distance between the supports of rails in the straightening presses shall not be less than 42 ins.

13. Circular holes for splice bars shall be drilled to conform accurately in every respect to the drawing and dimensions furnished by the railroad company, and must be free from burrs.

TESTS AND INSPECTION.

14. One drop test shall be made on a piece of rail not less than 4 ft. and not more than 6 ft. ft. long, selected by the inspector from each heat of steel, from any position in the ingot.

The test piece shall be placed head upwards on solid supports, 5 ins. radius, 3 ft. between centers, and both 85-lb. and 100-lb. sections shall be subjected to an impact test from a weight of 2,000 lbs. falling 15 ft.

The deflection for No. 1 classification rails must not exceed that indicated by a middle ordinate of 2 ins. in 3 ft. for 100-lb. section, and 2¼ ins. for 85-lb. section.

Test pieces shall be tested to destruction.

The temperature of the test pieces shall be between 60 and 120° F.

(a) If a test piece breaks without showing physical defects, all rails made from that heat shall be rejected absolutely.

(b) If, however, the test piece broken under test "a" shows physical defects, the top rail from each ingot of that heat shall be rejected; and

(c) A second test shall then be made of a test piece selected by the inspector. If this second test piece breaks, the remainder of the rails of the heat shall also be rejected. If this second pieces does not break, the remainder of the rails of the heat will be accepted as either No. 1 or No. 2 classification, according as the deflection is less or more, respectively, than the prescribed limit.

(d) If the test piece, test "a," does not break, but when tested to destruction shows pipe, the top rail from each ingot shall be rejected. The remainder of the rails of the heat will be accepted as either No. 1 or No. 2 classification, according as the deflection is less or more, respectively, than the prescribed limit.

(e) If the test piece, test "a," does not break, and when tested to destruction does not show pipe, the rails of the heat will be accepted as either No. 1 or No. 2 classification, according as the deflection under test "a" is less or more, respectively, than the prescribed limit.

Note—The drop test and the deflection requirements may be modified if considered advisable by the railroad company.

15. The drop-testing machine shall have a tup of 2,000 lbs. weight, the striking face of which shall have a radius of not more than 5 ins. The anvil block of the drop-testing machine shall weigh at least 20,000 lbs., and the supports shall be part of, or firmly secured to, the anvil. The foundations for the anvil block shall be such as will meet the approval of the railroad company.

16. No rails shall be accepted which contain any physical defects that impair their strength.

17. Rails improperly drilled or straightened, or from which the burrs have not been properly removed, shall be rejected, but may be accepted after being properly finished.

18. No. 2 rails to the extent of 5% of the whole order will be received. All rails accepted as No. 2 rails must have the ends painted white, and must be kept separate from No. 1 rails, and be shipped in separate cars.

19. Rails will be accepted and billed according to actual weights.

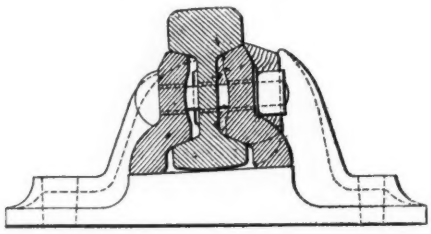
20. All rails must be loaded in the presence of the inspector.

21. The makers shall furnish the inspectors with the carbon determination of each heat, and, also, two complete analyses which shall represent the average steel of each day's work, before the rails are shipped. These analyses will be checked from time to time by the railroad company's chemist, and, on request of the inspector, the makers shall furnish a portion of the test ingot for check analyses.

22. Inspectors representing the railroad company shall have free entry to the works of the makers at all times when the contract is being filled, and shall have reasonable facilities afforded them by the makers to satisfy them that the finished material is furnished in accordance with these specifications. All tests and inspection shall be made at the place of manufacture, prior to shipment.

Bridge Rail Joint

A NEW type of rail joint was designed by W. Marriott, resident engineer, Midland & Great Northern Joint Railway, England, and is illustrated herewith. The fish-plate has the form of an arch and the rail-ends are carried over the space intervening between the sleepers



NEW RAIL JOINT.

by the fish-plates of which the extremities rest on the chairs. This joint has been tested out during the past year and has proved very satisfactory. The wear on rail-ends was scarcely noticeable after a period of 12 months' service and the cost of the joint is not prohibitive.

New Swing Bridge at Sculcoates, Hull

The new bridge has been constructed to replace an old wrought-iron swing-bridge, erected in 1853 to carry the Victoria, or East Dock, railway over the River Hull. The clear waterway of the new bridge is 53 ft. 6 ins. and provision has been made for an additional waterway of 40 ft. under the land arm. The bridge is built on a skew of 75° 30′, is 160 ft. over all, and is 29 ft. 6 ins. wide center to center of main girders. The bridge was built on a temporary foundation and, after completion, the bridge (including machinery) was moved into position over a path, consisting of a double row of piles with way beams and a double line of rails under each main girder. The bridge was designed by engineers of the North-Eastern Railway.

Attendance at Railway Convention

THAT the recent convention of the American Railway Engineering and Maintenance of Way Association was thoroughly representative of the engineering department of American railroads is shown by an analysis of the attendance.

The presence of the chief engineers, assistant chief engineers, engineers of maintenance of way, principal assistant engineers, bridge engineers, division engineers, signal engineers of practically all the principal railways of this country and Canada was an especially noticeable feature of the convention.

The total number of members registering during the meetings was 281, an increase of 70 over the preceding year. Of this number, 51 classified as chief engineers; 9 as assistant chief engineers; 32 as engineers of maintenance of way; 11 as principal assistant engineers; 19 as bridge engineers; 26 as division engineers; 25 as assistant engineers; 15 as signal engineers, etc. Ninety-one distinct railroads, with a total mileage of 166,429, were represented.

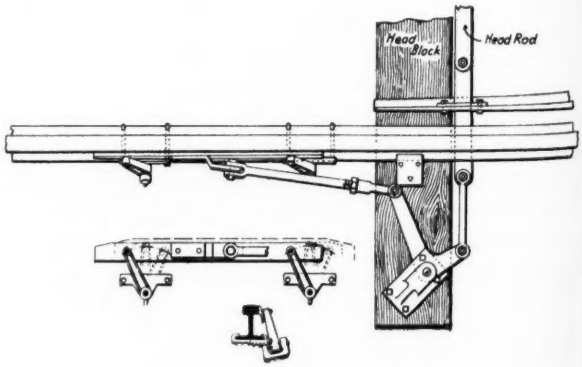
Automatic Switch Point Closer

AN effective device, simple in construction, was designed and put into service by J. W. McManama, roadmaster of the Fitchburg division of the Boston & Maine R. R. It is an auxiliary appliance which does not effect the regular operation of the switch.

The device consists of a short detector bar with a "push rod" connected by bell crank to the head rod of the switch. It is placed on the side of track opposite the switch stand. The device is shown in the accompanying illustration.

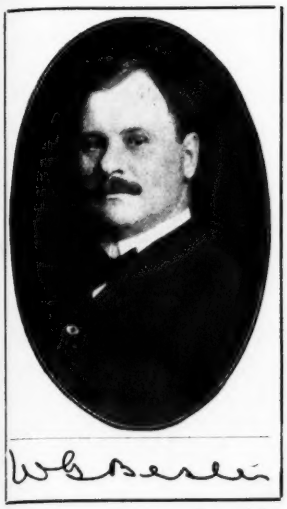
If the switch point should stand partly open, the detector bar projects above the top of rail. As a train approaches the facing point switch, the first wheel depresses the bar and automatically completes the throw of the switch point for either main track or siding. The device introduces an additional safeguard without any element of danger.

Many tests have been made to prove its practicability, and arrangements are now under way to manufacture the device.



SWITCH POINT CLOSER.

Opportunity



IN the first chapter of Genesis, 26th and 27th verses, we find, "And God said, 'Let us make man in our own image,' so God created man in his own image."

The Bible was written centuries ago. If it were to be written in our time there would undoubtedly be found something to the effect that Man was created a creature of circumstances, a soldier of fortune, a victim of environment and, as to what he actually is, practically without exception, the result of Opportunity. It would probably be said of him.

He comes into this world without his consent, and goes out against his will, and the trip between the two is exceedingly rocky. The rule of the contraries is one of the important features of the trip.

If he is poor, he is a bad manager. If he is rich, he is dishonest.

If he needs credit, he can't get it. If he is prosperous everyone wants to do him a favor.

If he's in politics, it's for pie. If he's out of politics, you can't place him, and he's no good for his country.

If he doesn't give to charity, he's a stingy cuss. If he does, it's for show.

If he is actively religious, he is a hypocrite. If he takes no interest in religion, he's a hardened sinner.

If he shows affection, he's a soft specimen. If he seems to care for no one, he is cold-blooded.

If he dies young, there was a great future ahead of him. If he lives to an old age, he has missed his calling.

But whichever way we turn, we finally come back to the crux of the situation, viz.: Opportunity, of which Ingals says:

Master of human destinies am I,
  Fame, love and fortune on my footsteps wait.
Cities and fields I walk; I penetrate
  Deserts and seas remote, and passing by
Hovel and mart and palace, soon or late
  I knock unbidden once at every gate;
If sleeping, wake; if feasting, rise before
  I turn away. It is the hour of fate,
And they who follow me reach every state
  Mortals desire, and conquer every foe
Save death: But those who doubt or hesitate,
  Condemned to failure, penury and woe,
Seek me in vain and uselessly implore—
  I answer not, and I return no more.

Some time ago I saw a statement to the effect that there are about eight kinds of men in the world, and they all want to make money.

Number One is a plodder, working for each day's wages as he gets it. He has absolutely no gambling spirit and never makes much money.

Number Two is a man who is willing to gamble, but who has poor judgment.

Number Three is the "smart" fellow who thinks nobody can fool HIM and that everybody is trying to. He is convinced that he has a corner on honesty. He is a direct descendant of the original Pharisee—why waste time with him? He is of the class that deal with "wire tappers" and green goods operators and howl like hyenas when they are bitten.

Number Four is timid—careful—not overwise in speculation but wishing to make more than day's wages. He is doubtful, but willing to be convinced by the straight testimony of manifestly honest men whose statements are borne out by proven facts.

Number Five is naturally a gambler—willing to take a reasonable chance—or an unreasonable one, if the odds are big enough. He is usually a shrewd observer of men and things, intuitive, quick, venturesome—and he wins or loses imperturbably. He is not a good man for Number Four to follow, but he is a "good sport" and in the long run usually comes out ahead.

Number Six needs a guardian. He has the sporting spirit—part way. He wants to gamble but does not stop to study the game. He does not distinguish between a legitimate business risk and a "shell game." He either hasn't brains enough to analyze a proposition, or does not use them. He goes in blind, and as the poor deals outnumber the good ones, he usually goes broke before he gets a good one. Or, if by accident he wins once, he loses the winnings quicker than he made them. He supports the bucket shops, the pool rooms and the fake promoters. He was born to lose because he will not, or cannot, use the brains the good Lord gave him. Whoever will promise him the biggest profit gets his money. There is no excuse for him and no help for him.

Number Seven is the backbone of the country—conservative without being hide bound, speculative in a broad and sensible way—willing to take a reasonable risk, but insisting on knowing just exactly what the risk is. Capable of analyzing a proposition right down to its elemental components. Honest, and insisting on honesty in others—believing that the men he meets are

Address by Mr. W. G. Besler, vice-president and general manager of the Central Railway of New Jersey, before the Central Railway Club.

fair and square, but keeping "his hand on his gun" until he tries them out. Goes into things on conviction—not on impulse—willing to admit that other people know things that he doesn't—willing to accept evidence and able to judge of its value—a good, strong, straight, fair, nervy American business man, who helps to build up the country. A safe man to trust and to follow.

Number Eight believes that the world ends just a few miles from home. He has heard of Denver and London and Leadville, but he hardly believes they are there—and if they are, they are inhabited solely by pirates, boa constrictors and things, and not at all by ordinary human people working just as earnestly and honestly as he does in Nanticoke or Skaneateles. In other words he can't see farther than the end of his nose—and it isn't a long nose. He says "real estate right here at home is good enough for me." Maybe it is good enough for him, but he never makes very much money. If he stacks up his interests and taxes against his rent receipts and increased valuation he maybe nets six per cent—maybe.

Summed up, every one of the eight must needs depend upon Opportunity.

Warren, in his "Thoughts on Business," says:

"There are many young men in business who, because of a lack of early training, either through limited opportunities or wasted opportunities, are struggling with a great handicap, which they hardly realize, in their limited knowledge of certain fundamentals of education. They resemble a man in a boat with only one oar, battling against the waves, without even knowing enough to wish for another oar, and without realizing that the reason others are making better headway is because they have two oars.

The fundamental branches of study—those which every schoolboy is supposed to learn in his early years, and which are often too meagerly understood by young men, are: How to spell, how to use correct grammar, good penmanship, arithmetic, geography, history and etymology.

Simple as these branches are, there are thousands who are deficient in them, and yet are blundering along through life, expecting to make a success in business, and yet not realizing how greatly they are handicapped by the lack of these things. Those who feel a lack in any of the simple fundamentals of education cannot afford to neglect any opportunity they can make to acquire some knowledge of those branches. Fifty years of hard work without them cannot hide the defect which may be overcome by a few years of night study."

Some twenty-five years ago, as a young lad, I was in the service of the C., B. & Q. Ry., and was working in the office of Mr. Henry B. Stone. At that time Mr. Stone was one of the leading lights in the railroad world, and the general time convention, which evolved the standard code, was the result of the work of such men as Mr. Stone and his associates, who dared to do a lot of things in the face of a storm of protest and ridicule, and declarations from a lot of the old-timers that it was impossible, impracticable and undesirable to bring about the uniformity which it was sought to accomplish.

I remember at one time Mr. Stone made this remark, or something akin to it:

"A man is a man, and whatsoever else he is is what he makes himself."

I was at an age when such things made an impression upon me, and I began to look about and see the application of the truth of his remark; and I have continued to look about through all the years since that time, and almost without exception—or perhaps it takes the exception to prove the rule—I have found the truth of the adage.

Several years ago I saw a statement attributed to Mr. Charles M. Hays, second vice-president and general manager of the Grand Trunk Railway, wherein he was quoted as having stated, in answer to the question to what he attributed his remarkable success in railroad work, that largely to opportunity and the element of good luck he attributed his rapid rise in railroad life. I have always respected Mr. Hays more for this alleged remark than many of the so-called "successful" railroad men who have, according to their statements, climbed the ladder—but the "ladder," we have very often found, consisted of but two rungs—a bottom and a top, with influence and money which bridged and pushed them over the intervening gap.

In my own case, and to whatever extent I have had success, I attribute a very large percentage thereof to the element Opportunity, which was given to me through the medium of two railway organizations, the first, a little organization known as "The Central Association of Railroad Officers"; the second "The St. Louis Railway Club." I need not go into details, more than to say that through the medium of those two organizations I made my friendships; I established for myself a place and whatever reputation I was able to secure was very largely accomplished through my association therein. Can you wonder, therefore, or can you blame me for having in my heart a very warm place for the "Railroad Club" and the "Railroad Association?" It is the opportunity presented to the young man to get his candle out from under the bushel. It affords an opportunity for the young man to give himself something of an education.

You all know that you can lead the horse to the water but you cannot make him drink. You all know that you can give a young man a position, but unless he has it in him to hold his job and go ahead from that starting point, he is a misfit, a dead load upon you, and sooner or later must be dropped from the list.

Some persons mistake a diploma as a guarantee of capacity. We sometimes wonder why a certain young man was such a great disappointment. I remember receiving, at one time, an appeal from a college graduate who wrote me, among other things, that he was the master of six languages, and yet here he was actually starving, and with no one to give him employment

Listen to what "Success" says of a college man who failed:

He became saturated with other men's thoughts.

He depended too much on books.

He thought his education was complete when he left college.

He regarded his diploma as an insurance policy against failure.

His mind was clogged with theories and impracticable facts.

He mistook a stuffed memory for an education, knowledge for power, and scholarship for mastership.

He knew languages and sciences, but was ignorant of human nature.

He knew Latin and Greek, but could not make a bill of goods or bill of sale.

He was well posted in political economy, but could not write a decent business letter.

His four years in the world of books left him permanently out of joint with the world and practical affairs.

He was about beginning at the foot of the ladder when he left college.

The stamina of the vigorous, independent mind he had brought from the farm was lost in academic refinements.

He thought that his four years' college course had placed him immeasurably above those who had not had that advantage.

He had never assimilated what he learned, and was crippled by mental dyspepsia.

The habit of discriminating minutely, weighing, balancing and considering all sides of a subject, destroyed his power of prompt decision.

He thought that the world would be at his feet when he left college, and made no effort to win its favor.

(He could not digest his knowledge.)

He knew enough, but could not manage it effectively—could not transmute his knowledge into practical power.

After all, a man is very much like a horse—it is not so much who or what he is, as what he can do, that makes him valuable.

And now, in conclusion, I propose to communicate to you a real secret and an open sesame for the uninitiated who wish to acquire success and position in the railroad profession. I will take a chance on this audience with the following, which, while it may not be understood by some of my hearers, will be by others; and I will say to those who do not understand, that there is in this city ample opportunity to give light to those who are found worthy and well qualified:

Superintendent Joe Maxwell, of the M., K. & T. Ry., has the reputation of being very particular in the matter of employing trainmen, desiring only those who have had considerable experience in that branch of the service. The following is a conversation said to have been overheard in Mr. Maxwell's office a short time since, between that gentleman and an applicant for a position as passenger conductor:

Where did you come from?

From General Manager St. John, of the C., R. I. & P.

What did you come here to do?

To learn to subdue my energies and improve the railroad service.

Then you are a railroad man, I infer?

I am so taken to be by all officials who know their business.

How may I know you to be a railroad man?

By looking over my letters and examining me in the signals.

Try me.

How will you be tried?

By the punch.

Why by the punch?

Because it is an emblem of honesty, and the principal working tool of my profession.

Where was you first prepared to be a railroad man?

In my mind.

Where next?

Upon a farm adjoining the right of way of a regular railroad.

How was you prepared?

By braking upon a threshing machine for six months, after which I went to town and sought admission to the trainmaster's office.

How gained you admission?

By three cigars placed in the open hand of the trainmaster's clerk.

How was you received?

Upon the sharp gaze of the trainmaster applied to my physiognomy which was thus explained. As it is always a source of great pleasure to the trainmaster to receive callers, I should drop in to chat with him a little while upon every occasion possible.

How was you then disposed of?

I was seated in a chair near to the trainmaster's desk, and asked if I put my trust in safety coupling devices.

Your answer?

Not if I know myself, I don't.

What was then done with you?

I was led up and down the yard three times to accustom me to the noise of the trains, thence to the chief dispatcher.

How was you then disposed of?

I was seated upon a brake wheel before a train box, and caused to take the following horrible and binding oath:

"I, Steve Sears, do hereby and hereon most everlastingly and diabolically swear by the great Horn Spoon that I will always remit and never conceal any of the cash collected by me as conductor, and that I will not cut, make use of, collect or remit any cash fares less than those found in the regular tariff book.

"I further promise and swear that I will not carry on my train free any railroad man's wife, mother, sister,

daughter or widow, or permit any other conductor to do so if I can prevent it.

"I further promise and swear that I will freely contribute to all subscriptions circulated to buy my superior officers 'a token of esteem, etc.', as far as he may desire and my salary will permit; to all of which I solemnly swear, binding myself under no less a penalty than that of having my salary cut from year to year, all my perquisites taken away and expended for sand ballast to put under the McKinney extension, where the trains come and go twice in twenty-four hours, so help me Bob Ingersoll and keep my back bone stiff."

What did you then behold?

The trainmaster's clerk approached me and presented me with a Bishop safety coupling knife, and instructed me to take it to the yardmaster, who would teach me how to use it.

How are Bishop coupling knives used?

By sticking them in the left hip pocket with the blade turned up.

Mr. Maxwell here informed the applicant that he was satisfied that he was a railroad man, and asked him if he would be off or from.

"I will be off from here if you will give me a passenger train."

Have you any cigars?

I have.

Will you give them to me?

That is not the manner in which I got them and I cannot so dispose of them.

How can I get them then?

I will match you heads or tails for them.

I will go you. Begin?

You begin.

No, begin yourself, you have the cigars?

Board.

A. Ah. All. Aboard. You are O. K. Come around again in the morning and I will arrange to send you down to the Trinity & Sabine Division to take the mixed train there.

Finally, with all of this admonition and benefit of secret advice, you cannot fail of success. What is success? He has achieved success who has lived well, laughed often and loved much; who has gained the respect of intelligent men and the love of little children; who has filled his niche and accomplished his task; who has left the world better than he found it, whether by an improved poppy, a perfect poem, or a rescued soul; who has never lacked appreciation of earth's beauty or failed to express it; who has always looked for the best in others and given the best he had; whose life was an inspiration, whose memory a benediction. For, in the language of Ralph Waldo Trine,—The greatest greatness and the only true greatness in the world is unselfish love and service and self-devotion to one's fellowmen.

The Maintenance of Way Association

THE instructions to the committees of the American Railway Engineering and Maintenance of Way Association for the preparation of reports to the March, 1909, convention are given below. The president of the association, Walter G. Berg, added the following introductory remarks:

In the following instructions the Board of Direction has outlined the important questions which, in its judgment, each Committee should preferably consider during the current year, so far as it may be able to do so; but the Board does not desire to prevent any Committee from presenting the results of any special study or investigation it may be now engaged upon or that it may consider important enough to take up at the next convention.

The following outline of subjects for consideration of the Committees has been prepared with a view to perfecting the work heretofore done by each Committee and extending it so as to cover important and live questions requiring attention.

The Committees are Standing Committees, continuing from year to year, and the work of the previous Committees should be as carefully guarded, continued and perfected as the new work assigned for the current year.

It is suggested that Committees should aim to report finally only on such subjects which they have been able to handle in a thorough and systematic manner to a point where final action on the part of the Association is necessary to give authoritative value to the work of the Committees.

Subjects only partially considered should be presented as a progress report, briefly discussed, and such data as collected presented as information, as far as thought desirable, without unduly overburdening the Association' Proceedings or duplication of publication.

I—COMMITTEE ON ROADWAY.

(1) Continue the consideration of track elevation and depression inside of cities, and grade and curve improvement work outside of cities, and submit recommendations covering more particularly questions of detail relative to the handling of the work.

(2) Report on the best method for determining the size of waterways.

(3) Report on the protection of the roadbed in embankment and excavation from the action of water, more particularly with reference to protection from washouts or overflows and from slides, whether caused by surface or underground water.

(4) Report on the surface and sub-surface drainage of embankments and excavations.

(5) Report on the tiling of wet cuts and the curing of slides.

II—COMMITTEE ON BALLASTING.

(1) Review the customary recommended practice for preparation and delivery of various classes of ballast, with cost of handling same, if practicable.

(2) Review the advantages and disadvantages of the various types of ballast, including stone of different kinds

ag and gravel, and the different qualities of gravel with reference to the amount of sand or clay contained.

(3) Report on the best method to be used in determining the wearing quality of crushed stone.

(4) Review the customary practice and practicability of treating stone ballast which has become foul under the ties.

(5) Prepare recommended principles of practice for slag ballast, chats ballast, cementing gravel ballast and chert ballast.

(6) Report on the necessity for and best material for sub-ballast.

(7) Review of special literature on the subject of ballasting.

III—COMMITTEE ON TIES.

(1) Continue the compilation of statistics upon the life of ties, both treated and untreated, and the causes of failure. Present summary compilation of reports received and draw such conclusions therefrom as the statistics warrant at the present time.

(2) Prepare critical review of the general question of the present and future status of the tie supply, the various methods heretofore adopted for reducing the yearly demands on the timber supply, and what general lines of investigation and change in existing methods may seem most desirable to be followed so as to secure the best results in the future.

(3) Collect statistics on the extent of the use and the life of metal or composite ties up to the present time, with illustrations and descriptions of the most successful designs, and draw such conclusions as the conditions may warrant.

IV—COMMITTEE ON RAIL.

(1) Continue the investigation of the breakage and failure of rails and present summary of conclusion drawn from reports received.

(2) Report on the results obtained from the use of open-hearth steel rails and the chemical composition of such rails.

(3) Report on any recommended changes in specifications for Bessemer steel rails as heretofore adopted by this association.

(4) Present recommendation as to standard rail sections.

(5) Present report showing diagrams or photographs of typical characteristic rail failures corresponding to the classification as given in form M. W. 1200, Report of Rail Failures in Main Tracks.

V—COMMITTEE ON TRACK.

(1) Review and revise the committee's report presented at the ninth annual convention, covering the following subjects:

(a) Report on the subject of turnouts and turnout material, including the best types of switchstands, switchpoints, frogs, guard rails and throat clearance, bearing in mind the possibility of an increase of the thickness of wheel flanges and the effect of worn ties and wheels upon the various parts of turnouts, frogs and crossings.

(b) Report on facing point switches for high speeds with a continuous main line rail.

(c) Confer with committee on signaling relative to switchstands.

(2) Continue investigations in connection with a subcommittee of the American Railway Master Mechanics' Association upon the subject of widening the gauge on curves and spacing of guard rails, as affected by the different lengths of engine wheel base, arrangement of flanged wheels and wheel wear.

(3) Report on whether wide gauge, which is due to worn rail, should be corrected by closing in or replacing the rail.

(4) Report on the extent rail should be worn before it becomes unsafe.

(5) Consider revision of paragraph (3), under "Proper Method of Spiking," Manual, 1907, p. 64, and report recommendation as to extent gauge on curves should be worn open before closing in is necessary.

(6) Reconsider and report any recommended change in "Standard Drilling for Rails," as heretofore adopted by this association (Manual, 1907, p. 65.)

VI—COMMITTEE ON BUILDINGS.

(1) Reconsider amended conclusion No. 5, relative to locomotive coaling stations (Bulletin 95, pp. 69-70.)

(2) Report on the use of reinforced concrete for coaling stations and storage bins.

(3) Collect data as to the actual use of reinforced concrete roofs for roundhouses, where located, life to date, results so far obtained, and critical analysis of advantages or possible defects; also diagrams of typical designs.

(4) Report on the best method for smoke removal, ventilation and heating of roundhouses.

(5) Report on the design and detail arrangement of oil houses at terminals.

VII—COMMITTEE ON WOODEN BRIDGES AND TRESTLES.

(1) Continue the revision of the specifications for structural timbers, co-operating with Committee Q of the American Society for Testing Materials and other committees on the subject, with a view, if possible, of preparing a uniform standard specification.

(2) Prepare a list of recommended safe unit stresses for structural timbers.

(3) Revise the report on standard names for structural timbers.

(4) Study the principles and methods of pile-driving and collect data relating to the current practice.

(5) Report on best method for classification of pine timber for structural purposes in place of classification by botanical names.

VIII—COMMITTEE ON MASONRY.

(1) Reappoint a sub-committee to co-operate with the "Joint Committee" on concrete and reinforced concrete.

(2) Collect data upon the reported failures of concrete structures and the probable cause of same.

(3) Investigate and report upon the waterproofing of masonry, covering methods, results, cost and recommended practice.

(4) Report on the use of reinforced concrete trestles, typical designs, cost and recommended practice.

(5) Present typical plans of retaining walls and abutments, plain and reinforced, with comparison and recommended practice.

(6) Report on the desirability of all monolithic construction in arches or large abutments with wing walls.

(7) Submit specifications for reinforced concrete.

IX—COMMITTEE ON SIGNS, FENCES, CROSSINGS AND CATTLE-GUARDS.

(1) Present such additional recommendations and conclusions covering the various subjects reported on in the previous reports of the committee as may be considered desirable.

(2) Report on snow fences, snow sheds and other means to prevent snow accumulating and best methods of clearing tracks and snow removal.

(3) Report on the use of concrete fence posts, results obtained so far in actual service, designs and cost.

X—COMMITTEE ON SIGNALING AND INTERLOCKING.

(1) Mechanical interlocking specifications.

(2) Electric interlocking specifications.

(3) Rubber-covered wire specifications.

(4) Prepare standard contract for signaling work.

(5) Prepare outline and description of a comprehensive system for universal signaling, suitable for general adoption.

(6) Confer with committee on track relative to switch-stands.

XI—COMMITEE ON RECORDS, REPORTS AND ACCOUNTS.

(1) Revise "Track Chart," form M. W. 1016, so that the chart will show the conventional signs as adopted by the association.

(2) Recommended any desirable changes in conventional signs as heretofore adopted.

(3) Review the subject of "Time Book" and recommendations as to revising form M. W. 1008, with a view to preparing a form that may be uniformly used for all maintenance of way departments, and offering a check against irregular practices and allowing the use of a daily time report.

(4) Recommend forms for use of maintenance of way departments for preparing preliminary detailed estimates of contemplated construction work, this form to be used preliminary to and form the basis for the summary estimate data embodied on form M. W. 1017.

(5) Prepare forms for collecting and analyzing rail statistics.

XII—COMMITTEE ON UNIFORM RULES, ORGANIZATION, TITLES, CODE, ETC.

(1) Supplement "General Rules for Government of Employes of Maintenance of Way Department."

(2) Prepare special rules for foremen and other employes, properly grouped and classified in accordance with and supplementary to the general rules heretofore adopted.

XIII—COMMITTEE ON WATER SERVICE.

(1) Report on the use of coal, gasoline or other fuels as motive power for pumping plants, with relative economy and desirability of each system under different conditions.

(2) Report on the general principles of the water supply service, independent of the question of water treatment and on typical installations for various characteristic conditions.

(3) Report on various types of track tanks, with designs of typical installations, and critical review.

XIV—COMMITTEE ON YARDS AND TERMINALS.

(1) Report on the average and maximum classifying capacity of Hump Yards with one or two scales on the hump and the number of yard engines required under varying conditions.

(2) Report on terminal freight houses at large terminals and transfer points, more particularly with reference to general arrangement of buildings and platforms and the track layout.

(3) Development of mechanical handling as a means of promoting rapidity and economy in the handling of freight.

(4) The relation of the percentage or proportion of cars to be weighed to the location of scales on the hump or elsewhere, and if not placed on the hump, where should scales be placed, and the reasons therefor; also how weighing is done where cuts of cars are switched.

(5) Report on the feasibility of transferring freight by means of movable freight platforms, and outline of methods.

XV—COMMITTEE ON IRON AND STEEL STRUCTURES.

(1) Continue investigations as to impact tests.

(2) Continue investigations in regard to injury to bridges and railroad structures caused by flat spots on wheels, conferring with committees of other associations.

(3) Report on the care of existing bridges, inspection, methods of field work and records of inspection.

(4) Report on the maintenance of bridges, including protection of steel structures from corrosion.

(5) Specifications for bridge erection.

(6) Report to what extent steel bridge construction for the main girders of bridges carrying heavy loads under high speeds is preferable to reinforced concrete construction.

XVI—COMMITTEE ON ECONOMICS OF RAILWAY LOCATION.

(1) Continue the consideration of all questions connected with railway location, grades, lines and improvement of grades and lines affecting the economic operation with relation to traffic, tonnage ratings, speed, density of traffic and financial considerations, with the special aim in view of establishing uniform methods and unit values for investigating and analyzing the relative changes and costs of comparative routes or proposed grade reductions and line corrections.

XVII—COMMITTEE ON WOOD PRESERVATION.

The Committee work is to cover in general the investigating and reporting on the preservation of wood used

for ties and for railroad structures and buildings, confining the work of the Committee more particularly to processes, methods and results obtained.

Present recommendation as to outline of work for the Committee, with suggestion for classification to be followed.

Continue the work done heretofore by the Committee on Ties and on Wooden Bridges and Trestles, relating to the special subjects of processes and methods of wood preservation.

The Investment and the Engineer

THAT the true value of a property is not clearly shown by the management's books and that, besides the financial status, the physical condition of the property must be known in order to conscientiously recommend an investment in the property, are becoming more generally known. In a paper entitled "The Relation between Banker and Engineer," presented by Mr. J. C. Kelsey before the Western Society of Engineers, this subject was discussed and extracts from the paper are as follows:

If the banker does not wish to be deceived as to the worth of the property, he must have competent advice. Not only must the auditor go over the books, but the engineer must go over the physical property. He must understand the needs of the property, not only now, but ten or twenty years hence. He must thoroughly understand depreciation. He must be thoroughly familiar with the best operating methods, and able to judge exactly as to the competency of the management.

The engineer must be a business man. Engineering is a business and not a profession as some are determined to have it. The successful engineer may stand for ideals, but he bears in mind the natural demands of the banker and public, that the property receive sufficient money, pay out money, and like the individual, save money for a rainy day.

This homely expression signifies the necessity of what is called the renewal reserve. In all properties owned by security holders, there is a sacred necessity which lies in the saving of enough money out of the daily or yearly income to take care of all changes in the art, all destruction due to the elements, and to hold the value of a one hundred dollar security at one hundred dollars or over for all time.

As the property wears out, it decreases in value. Assume that, in a certain time, it decreases to a value of ninety cents on the dollar. Then the security owner is entitled to be assured that the necessary ten cents is in the reserve treasury and available for the purpose of holding the value at 100 cents on the dollar. In other words, that the security holder may be sure that there will be no assessments, nor cessation of dividends, to take care of depreciation.

The renewal reserve charges should come ahead of the bond interest. If a property cannot pay renewal reserve charges and bond interest simultaneously, there should be a default. A property that is not protected by a cash renewal reserve, is not a real conservative investment. Book reserves are of no value, and reserves invested in the property itself do not carry out the idea of security.

Railroads could invest reserve funds in tie property or coal lands, and carry out the idea nicely and electric light, trolley and telephone systems could safely invest reserve funds in the municipal bonds of their immediate locality and carry out the idea of absolute security; but this idea is rarely fulfilled.

The engineer takes the following part in a contract between the banker and the property management, after the questions of reserve and other details are settled. The contract should contain the following thoughts at least:

"The engineer of the bankers shall be furnished every facility to inspect the plans proposed for construction of extensions and improvements, the contracts and prices paid for labor, material and incidentals connected therewith; and the work during its progress, in order that he may certify that the plans adopted are the most economical to produce the best results: that the prices paid are lowest consistent with first class work, and that the work has been executed within the terms of the mortgage. He shall have access to all operating departments, and shall be furnished with all desired information. He shall have power to make tests, and to criticise operating methods. He shall report directly to the bankers, and said report shall not necessarily be accessible to the active management of the property."

It is understood that the contract gives the banker power to act upon the recommendations, but that is another story. With such a clause as above, the banker has direct means of knowing accurately every vital point concerning the property he has so nicely described to the public. If the property management is niggardly with maintenance and repair, thereby rendering the contracted renewal reserve fund insufficient, the banker can call a halt. If the management is extravagant in operation and conduct of the business, thereby endangering bond interest, the banker knows it before it is too late.

The day is coming when all public utilities will have to take a defined position. Through the medium of broad-minded state commissions, properties will be conducted differently in the future. They will have to meet public demands promptly. They will not dodge taxes. They will be responsible for their employes safety. They will have to co-operate with the municipality in beautifying the city. They will have to maintain renewal reserves and shall be ordered to invest them by law.

Under the new order, securities will be guaranteed because the property has conformed to the commissions' orders. There will be many things required of the companies that would give the present directors and legal advisers apoplexy.

This tendency means simply a closer study of reserves. The State Commissions are studying the matter with us, and as engineers we shall help them to arrive at good conclusions.

The panic of October and the subsequent decline in

business activity was not caused by President Roosevelt or the New York Stock Exchange. The recklessly run trust companies temporarily furnished the germ of over prosperity, and later their own game of imbecile finance paid the penalty.

Any security was snapped up by these concerns, and for a time they made fabulous profits; but the old saying, "Truth is mighty and will prevail" proved itself once more. Then followed a panic of distrust, ruin and suicide.

But a new day is dawning. All things commercial will have to be satisfied with less profit, because lessened risks will be demanded. The sober-minded public, which do the investing will demand reasonable profit, and absolute safety. The public will always have money to invest. There will always be a chance for them to invest. The public will always invest through the banker. The banker will have to practically guarantee his investment advice if he expects to survive. To do this, he will seek the engineer.

The investments of the public will be guaranteed in their fullest sense only when there is a wedded relation between the ideals of the banker and engineer.

Statistics on Block Signals

The block signal and train control board of the Interstate Commerce Commission has made a compilation of data relative to the block signal equipment of American railroads on January 1, 1908. On that date 10,803 miles of railroad was equipped with automatic block signals and 47,856 miles with non-automatic block signals, or 58,679 miles altogether under block signal protection. These figures show that there has been an increase of 9935.5 miles in block-signal mileage in the United States since Sept. 30, 1906. This increase represents 5959.4 miles of manual block and 3976.1 miles of automatic block. The increase in automatic block-signal mileage applies largely to single-track lines, the increase in single-track automatic mileage being 2331.1 miles, while the two, three, and four-track mileage increase amounts to only 1645 miles. It appears from the itemized statements that the block system is used for rear-end protection only on 8130.3 miles of road, while permissive movements are allowed on 38,828.19 miles. On some roads, where permissive movements are allowed, however, the practice covers only freight-train movements, an absolute block being maintained for passenger trains.

Personals

Mr. P. G. Burns, chief engineer, Trinity & Brazos Valley Railway, is now located in the Burnett building, Houston, Texas. His former address was Fort Worth.

Mr. I. S. P. Weeks has been appointed engineer maintenance of way of the Chicago, Burlington & Quincy R. R. in charge of the lines west of the Missouri river, with headquarters at Lincoln, Neb. Mr. F. T. Darrow has been appointed assistant engineer maintenance of way at the same place.

Mr. Kenneth Hanger of Little Rock, Ark., has been appointed engineer of maintenance of way of the Choctaw district of the Chicago, Rock Island & Pacific, with headquarters at El Dorado, Ark. He will have charge of the Louisiana division from Haskell to Eunice, La.

Mr. John E. Greiner has resigned as assistant chief engineer of the Baltimore & Ohio Railroad for the purpose of devoting his entire attention to the profession of consulting engineer. This announcement has just been made by Mr. D. D. Carothers, chief engineer. In this capacity he will continue to give the Baltimore & Ohio Railroad the benefit of his expert knowledge. He will immediately open offices in Baltimore, New York and Chicago.

The headquarters of Mr. G. B. Hazlehurst, chief engineer, and of Mr. W. A. Walker, roadmaster, of the Georgia & Florida, have been removed from Augusta to Douglas, Ga.

Mr. E. P. Safford, formerly roadmaster of the Old Road division of the Lake Shore and Michigan Southern, has been appointed roadmaster of the Buffalo, or Eastern division, with headquarters at Silver Creek, N. Y. He succeeds the late Michael Conners. Mr. J. B. Martin has been appointed roadmaster on the Old Road division, succeeding Mr. Safford, with headquarters at Adrian, Mich. Mr. M. E. Gowen will succeed Mr. Martin as roadmaster of the Lake Erie, Alliance & Wheeling, with headquarters at Alliance, O.; Mr. Homer W. Loomis will succeed Mr. Gowen as roadmaster of the Fort Wayne division, with headquarters at Hillsdale, Mich.; and Mr. T. W. Dempsey wil succeed Mr. Loomis as roadmaster of the Lansing division, with headquarters at Hillsdale, Mich. Mr. Martin and Mr. Loomis formerly were roadmasters on the Dunkirk, Allegheny Valley & Pittsburg, with headquarters at Dunkirk, N. Y.

Auto Track Car

The Tool & Railway Specialty Mfg. Co., of Atchison, Kan., are now manufacturing the AuTraKar, illustrated herewith. The machine was designed by H. W. Jacobs, assistant superintendent of motive power, Atchison, Topeka & Santa Fe Railway, to reduce the cost of driving screw spikes, but, as is shown, the machine is capable of other work, which keeps the machine or machines constantly in service.

With the more general use of treated ties and tie plates, the screw spike will be used in larger quantities because it holds better than the ordinary spike and is therefore less injurious to the tie. The chief objection to the screw spike was the cost of the spike combined with the labor and time required to drive it. This new labor and time saving device overcomes the principal objectionable feature, decreasing the time and labor required in the proportions given below. The cost of the screw spike should not be prohibitive now in view of the introduction of the AuTraKar.

The car is essentially a motor-driven section car, equipped with a 10-h.p., 2 cylinder opposed, air-cooled, gasoline engine, which will run 1,000 revolutions per minute. If it is desired, a 4-cylinder vertical engine of the same power can be used. The

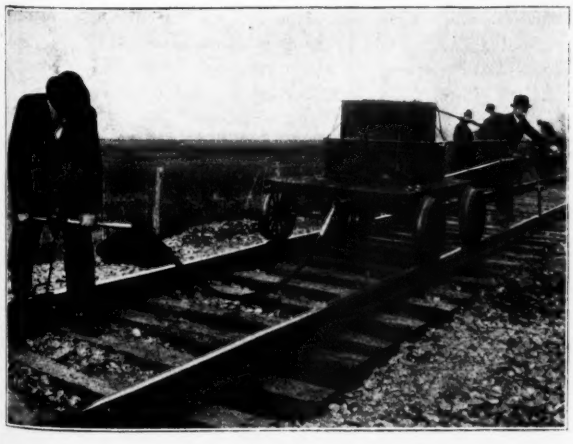
engine uses about five gallons of gasoline and one pint of cylinder oil in 10 hours. The car is propelled by a sprocket and chain, either backward or forward, at a speed of 15 miles an hour. Clutches and operating lever are arranged for convenience in controlling. The car will operate on heavy grades without difficulty and will haul two heavily loaded push cars on level track at 10 miles an hour.

The engine is also coupled to operate shafts which extend from both ends of the car and which terminate in universal joints for connection to telescopic shafts transmitting power to the several track tools. When equipped for driving screw spikes the forward shaft is connected with a high-speed wood drill, running at the same speed as the engine, and the rear shaft is connected with a "driver" running at 24 revolutions per minute. The forward operator bores the holes either with or without the use of a jig to properly space them and places the spike in the hole ready for driving, while the rear operator drives the spikes home.

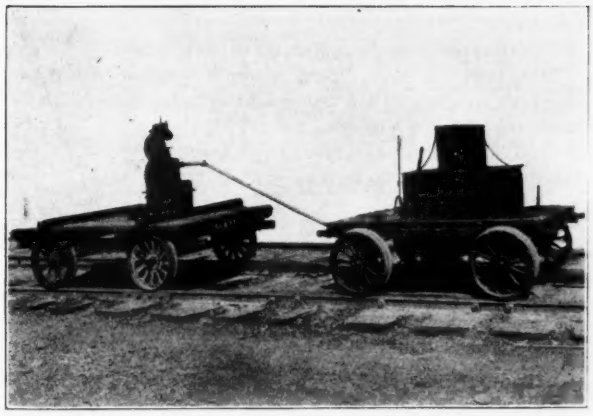
Holes can be drilled in from 5 to 10 seconds, depending upon the kind of wood, from 250 to 300 holes per hour being made by experienced men. Spikes are driven in from 10 to 20 seconds, depending upon the kind of wood and the diameter of the hole drilled. The car is equipped with two sockets for spike drivers, so that two of these can be used at once. Even progress can thus be made with one man drilling holes and two driving spikes. With four holes and spikes applied to each tie the car will cover over 1,000 feet of track per day. Practice shows that two men with a hand auger can drill about 80 holes an hour or about one-third the work of the machine. With a hand wrench two men can drive or screw in about 50 or 60 spikes per hour, or about one-eighth of the work of the machine when equipped with two spike drivers. The driver is fitted with reversing apparatus, so that spikes can be screwed out as well as in. The drill can be stopped by the operator instantly. A releasing device on the driver can be adjusted so as to screw the spike onto the rail as tightly as may be desired and will release automatically by means of friction while in motion.

A number of additional attachments can be used with the car, which makes it useful for general track work. In one illustration the car is connected up to a rail saw. A rail grip, holding an angle device, is also used to drill holes for bonding. For bridge work the car can be set to one side of the track and the work carried on without interference with traffic. A small air compressor and storage reservoir complete on four wheels and weighing less than 600 pounds can be operated by the engine of the track car and all work done on bridges.

The car, shown in the illustrations, is now in use on the Atchison, Topeka & Santa Fe. It is made of an elm frame, reinforced with steel angles and weighs about 500 pounds. The gasoline is carried in a storage tank placed in the back provided for the seats in the center of the car and the engine and gears are so placed as to make the car very compact and easily handled.



BORING HOLES AND DRIVING SCREW SPIKES.



AU-TRA-KAR AND RAIL SAW.

Rail Anti-Creepers

The Quincy, Manchester, Sargent Co. recently offered prizes to individuals in charge of track work for the best answers to certain inquiries regarding the use of and suggestions for rail anti-creepers. The judges of awards were as follows: Mr. W. M. Mitchell, Kentucky & Indiana Bridge & R. R. Co., representing the railroads; Mr. O. Metcalf, Jr., American Railway Device Co., representing the selling interests of rail anti-creepers; Mr. W. C. McMahon, president of the Belle City Malleable Iron Co., representing the manufacture of the same. They awarded the prizes as follows: First prize, W. H. Kofmehl, Rdm., C. M. & St. P. Ry., at Elgin, Ill.; second prize, W. H. Hoyt, Duluth Missabe & Northern R. R., at Duluth, Minn.; third prize, J. Boland, Rdm., Union Pacific R. R. at Cheyenne, Wyo. Much interest was shown in the replies, which told of satisfactory results in the use of rail anti-creepers. A few extracts from these reports are given below:

"Used two to a rail except on heavy grades where six or seven were used. Had a double track division, very hilly, and consider them a necessity for cheapening the cost of maintenance where track creeps."

"Used three to a rail. Had one five-mile section of 2 per cent grade that would creep two inches per month down the hill. Was successful in preventing this creeping by using anti-creepers. Used them at rail crossings, turntables, scales and inter-lockers, and have been able to cut out almost all of the trouble and expense."

"Used them on a 2 per cent grade where the traffic is all down hill and have been able to prevent all creeping of the rails."

"Rail is laid with broken joints. Have put on two anti-creepers on the tie opposite the joint. They will pay for themselves every year. Have used them on heavy down grade, prevented rail creeping, and have had none broken in three years time."

"Used four to the rail, two at the center and one at each quarter of 30-ft. rail. Have used them on the heaviest grades, and they saved almost all of the work of shifting staggered ties."

"Used six to a rail with an experience of over eighteen months, and have had excellent satisfaction. The expense in maintaining the track, where anti-creepers have been used, have been about one-third of what it was before using."

"Have had excellent satisfaction for a period of over three years. Have had track that crept two feet in one year which

has, however, been absolutely prevented from creeping by using this device."

"Two to a rail have helped on a 2 per cent grade."

"Have had one very difficult piece of track in muck land where we used six to the rail and have had excellent satisfaction."

"Have had 1½ per cent grade, high speed, heavy locomotives. Where anti-creepers were used had no trouble using two or four to the rail."

"Have used three to the rail. Track that was impossible to hold before is now successful."

"On one hill four miles in length, with heavy grade, where the rail was creeping and at the foot of the hill, the rails would crowd out of line. Rail anti-creepers have absolutely saved all trouble."

Several report having tried so-called home-made devices made from sections of angle bar bolted to the rail, and to the tie, but in all cases these are spoken of as expensive to apply and unsatisfactory in results, with considerable criticism of any device which required making an additional hole in the rail.

Trade Notes

The Northern Pacific Railway Company has issued a pamphlet, entitled, "The Land of Geysers," which is excellently illustrated and contains a historical review and narrative of the Yellowstone National Park.

The April issue of "Graphite" contains an article, entitled "Dixon's Crayons for R. R. Work." The advantages of Dixon's Yellow Crayons to engineers and surveyors are outlined and complimentary remarks of railroad officials are referred to.

John C. Sesser, Engineer of Maintenance of Way of the Chicago, Burlington & Quincy at St. Louis, Mo., has resigned to go to the W. K. Kenly Co., Chicago, as vice-president in charge of the railroad department.

Commonwealth Steel Company, St. Louis, Mo., has recently shipped one of its self-propelling gasoline weed burners to the Kansas City, Mexico & Orient, to be used in Kansas and Oklahoma.

Balanced Chute Dump Car Company, St. Louis, has been incorporated with a capital stock of $500,000 by Arthur T. Morey, Oliver T. Ledford and Frank L. Morey.

D. R. Day, for 10 years secretary of the Northwestern Malleable Iron Company, Milwaukee, Wis., is now manager of the Union Malleable Iron Company, East Moline, Ill.

Railroad Supply Company, Chicago, on May 1 will remove its New York offices to 540 Hudson Terminals, Cortlandt building.

The Weisenborn Signal Company has been chartered at Houston, Tex., for the purpose of manufacturing railroad signals. The incorporators are John M. Spellman, J. W. Ragsdale, George A. Davis and G. P. A. Weisenborn. The capital stock is $10,000.

The offices and plant of the Gordon Battery Company have been moved to Aldene-Roselle, N. J.

The offices of the General Contracting & Engineering Co., 15 Whitehall street, New York, will be moved on or about May 1 to the Hudson Terminal building, 50 Church street.

Technical Publications

AUTOMATIC BLOCK SIGNALS AND SIGNAL CIRCUITS, by Ralph Scott. Published by McGraw Publishing Co., New York. Cloth binding, 243 pages, 6x9 ins., illustrated. Price, $2.50.

The first chapter is devoted to the principles of signaling and the next few chapters to simple, normal danger, normal clear and semi-automatic circuits. The various signal systems, auxiliary appliances, signal apparatus, electro-pneumatic and electro-gas signals, electric locking, all-electric interlocking, 3-position and electric railway signals, and maintenance of signal apparatus are covered in the following chapters.

American practice in the installation and maintenance of signals electrically controlled, and operated by electric or other power, with description of the accessories now regarded as standard is clearly given in this volume. The book is written for the signal and railway engineer, the electrician and the layman.

METHODS FOR EARTHWORK COMPUTATIONS, by C. W. Crockett. Published by John Wiley & Sons, New York. Cloth binding, 114 pages, 6x9 ins., illustrated. Price, $1.50.

In this volume a series of rules is presented by which the terms necessary for the numerical computations of volumes may be written directly from the notes. The first chapter deals with the application of the prismoidal formula when the cross-sections are determined by levels; the second, with the application of the average end area method when the cross-sections are determined by levels; the third, with prismoidal correction when the cross-sections are determined by levels; the fourth, with the application of the average end area method when the transverse slope of the ground is measured; the fifth, with the correction for curvature, and the sixth, with the application of the Crockett volume slide rule in this work. The third appendix gives rules in such manner as to make their application simple and rapid. General rules are given first and followed by rules prepared for special cases, the latter gaining in simplicity as their application becomes more limited.

STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS, by a number of specialists. Published by the McGraw Publishing Company, New York. Leather binding, 1,283 pages, 4x6½ ins., illustrated.

In the preparation of this volume the entire field of electrical engineering was divided into 20 sections or units and arranged in a logical order. Each of the sections was then assigned to a specialist, who was supplied with a detailed outline of all sections, to avoid duplication of material.

The thorough and practical treatment which each subject received, as well as the arrangement of the material, makes the volume of great service to any electrical engineer. Among the authors are the following: Otis Allen Kenyon; A. S. McAllister, Ph. D.; H. M. Hobart; Edward Syndon; R. C. Beardsley; George Shadd; Arthur Vaughn Abbott; Louis Bell, Ph. D.; A. H. Armstrong; E. F. Roeber, Ph. D.; Kempster B. Miller, and William H. Onken.

THE DESIGN OF TYPICAL STEEL RAILWAY BRIDGES, by W. Chase Thomson, M. Can. Soc. C. E. Published by the Engineering News Publishing Co., New York. Cloth binding, 178 pages, 6x9 ins., illustrated.

The introduction contains a specification for steel railway bridges and instructions for constructing the moment-diagram. The following chapters describe in detail the design of the following types of bridges: A 60-ft. deck plate girder; a 100-ft. deck Warren girder; a 150-ft. through Pratt truss; a 200-ft. through Pratt truss with curved top-chord; a 170-ft. swing-bridge; a railway viaduct, and additional types of steel railway bridges. The last chapter deals with the latticing of compression members.

The book should be of assistance to engineers in actual practice and to students and draftsmen in designing offices. Practical methods of designing bridges are given, showing how to begin and how to complete them.

HOW TO USE SLIDE RULES, by D. Petri-Palmedo. Published by Kolesch & Co., New York. Board covering, 56 pages, 4x7 ins., illustrated. Price, $0.50.

This booklet instructs those, not familiar with the slide rules, in regard to the principles upon which it is constructed. The first part deals with simple applications and the latter with the use of the slide rule in the solution of more complex problems.

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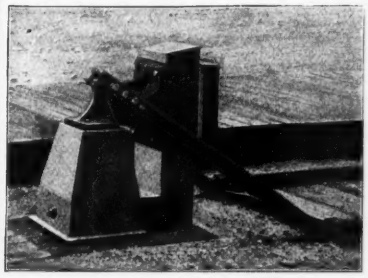

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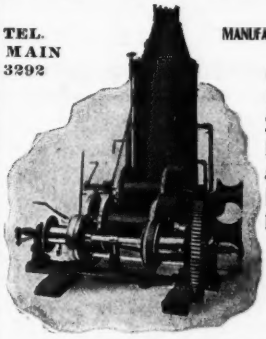

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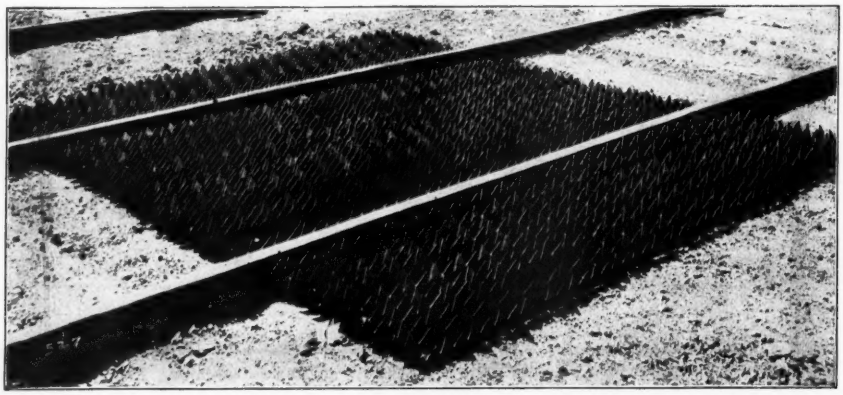

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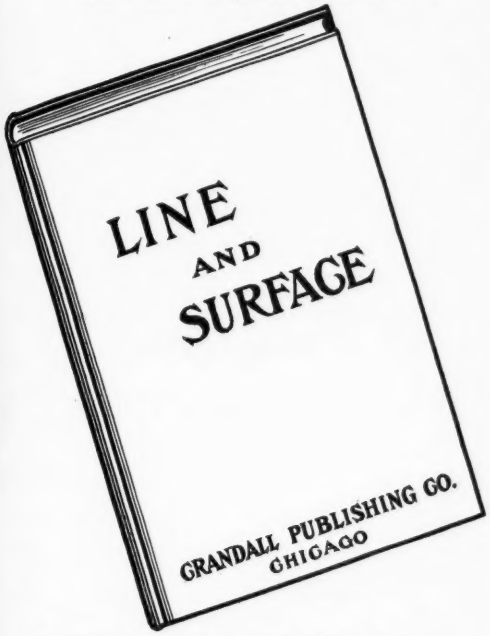

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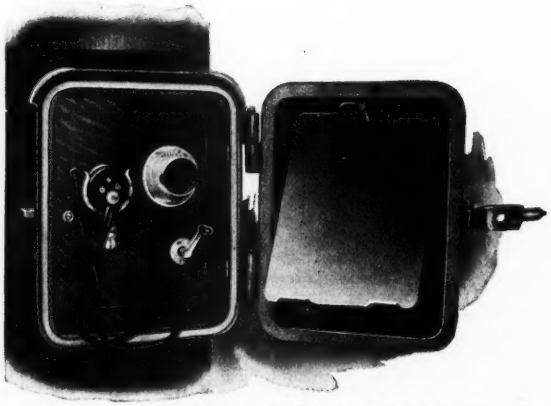

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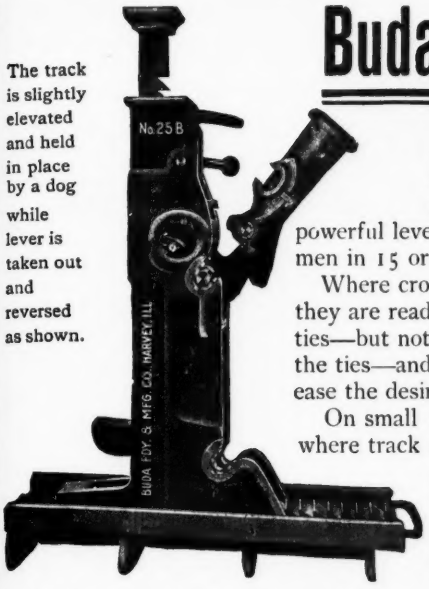

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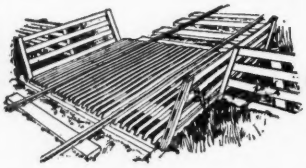

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